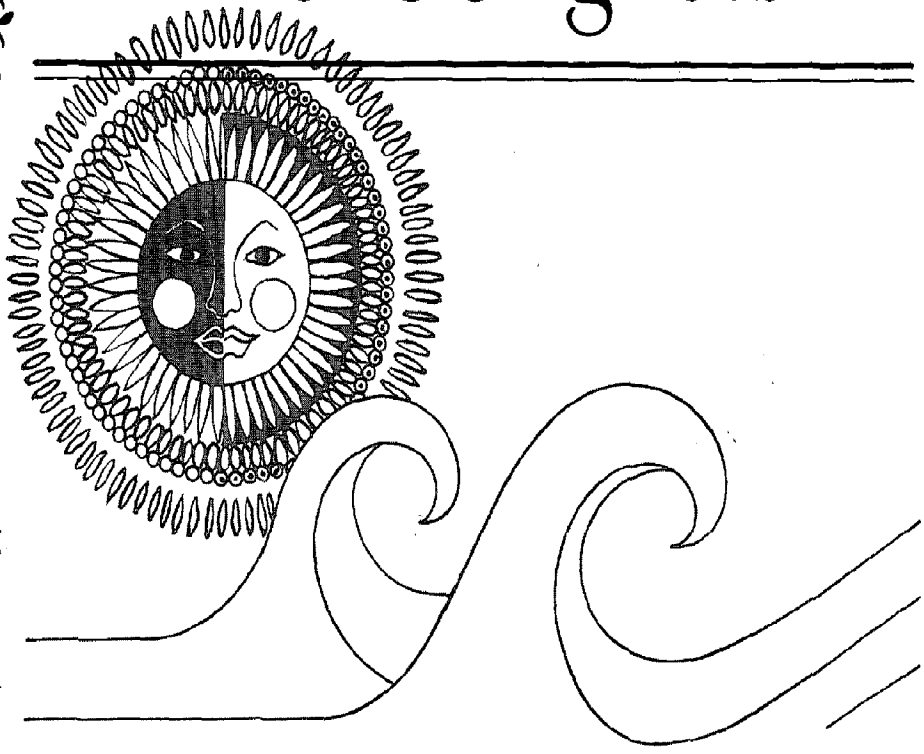
A Report to:

The President and The Congress



Sixth Annual Report June 30, 1977

6

National Advisory Committee on Oceans and Atmosphere

NATIONAL ADVISORY COMMITTEE ON OCEANS AND ATMOSPHERE

William J. Hargis, Jr., Chairman
Director
Virginia Institute of Marine Science

Donald L. McKernan, Vice Chairman
Director, Institute for Marine Studies
University of Washington

Werner A. Baum
Chancellor
University of Wisconsin-Milwaukee

Charles A. Black
President, Mardela Corporation

E. H. Clark, Jr.
President and Chief Executive Officer
Baker International

Marne A. Dubs
Director, Ocean Resources Department
Kennecott Copper Corporation

Michael Raoul-Duval
Attorney at Law
Mead World Headquarters

John N. Garner
Independent Insurance Agent
Pacific Northwest Insurance Brokers

Lawrence J. Hogan
Attorney at Law, Hogan and Hogan

A. Richard Kassander, Jr.
Vice President for Research
University of Arizona

Alfred A. Keil
Dean, School of Engineering
Massachusetts Institute of Technology

Helmut E. Landsberg
Professor Emeritus
Institute for Physical Science
and Technology
University of Maryland

L. Jay Langfelder
Director, Center for Marine and
Coastal Studies
North Carolina State University

John A. McWilliam
General Manager and Chief Executive
Officer
Toledo-Lucas County Port Authority

John R. Michels
President, Michels Development
Company

Grover E. Murray
University Professor
Texas Tech University Complex

William A. Nierenberg
Director
Scripps Institution of Oceanography

Oliver L. Peacock, Jr.
President and General Manager
Peacock Fruit and Cattle Corporation

Jim D. Rearden
Outdoors Editor, ALASKA Magazine

Herman T. Schneebeli
H. T. Schneebeli Distributing Company

Kenneth C. Spengler
Executive Director
American Meteorological Society

George M. Sullivan
Mayor of Anchorage

John W. Tukey
Associate Executive Director
Research-Communication Principles
Division
Bell Laboratories

J. Robinson West
Vice President and Assistant to the
Chairman
Blyth Eastman Dillon and Company, Inc.

Warren S. Wooster
Professor, Institute for Marine Studies
University of Washington

Executive Director: Douglas L. Brooks
Staff: Abram B. Bernstein, Robert Gary, A. Joseph Heckelman, Eileen L. Shea, Samuel H. Walinsky, and John T. Willis.
Supporting Staff: Diane G. Smith, Delphenia W. Brodie, Louise S. Lucas, Mary F. McCotter, and Debra L. Walker.

A Report to:

The President and The Congress

by the

National Advisory Committee on Oceans and Atmosphere

Sixth Annual Report

June 30, 1977
Washington, D.C.

For Sale by Superintendent of Documents
U.S. Government Printing Office, Washington, D.C. 20402.

NATIONAL ADVISORY COMMITTEE
ON
OCEANS AND ATMOSPHERE
Washington, D.C. 20230

To the President and the Congress:

Sirs:

I have the honor to submit to you the Sixth Annual Report of the National Advisory Committee on Oceans and Atmosphere.

The Committee was established by P.L. 92-125, approved on August 16, 1971, and was directed to submit a comprehensive annual report to the President and to the Congress setting forth an overall assessment of the status of the Nation's marine and atmospheric activities.

We are pleased to be able to comment this year on such important marine matters as national goals for utilizing the sea and its resources, means for more effective pursuit of these goals, marine transportation, Law of the Sea, ocean engineering and research, and the need to educate the public in marine matters. On the atmospheric side, we discuss air pollution monitoring, weather warnings and forecasts, and preservation of historical weather records. As in past years, NACOA has selected topics that it feels are ripe for action. Recommendations for specific action are given where possible.

The report also includes five short status reports on aquaculture, weather modification, climate, coastal zone management, and the GLOMAR EXPLORER.

Because the global context in which our marine affairs are conducted is undergoing such rapid change, we would call your attention particularly to our recommendation for a White House-level mechanism for developing a coherent national marine strategy and coordinating the numerous agencies with key roles in its execution. This need will continue to exist, in our opinion, even though organizational consolidation for marine affairs takes place along lines NACOA and others have previously recommended.

This report is sent via the Secretary of Commerce as provided for by the statute.

Respectfully,

William J. Hargis, Jr.
Chairman

June 30, 1977

FOREWORD

The National Advisory Committee on Oceans and Atmosphere (NACOA) was created by P.L. 92–125 on August 16, 1971. Among other duties, the Committee is charged with assessing the status of the Nation's marine and atmospheric activities and submitting an annual report of its findings and recommendations to the President and to the Congress. The law also requires the Secretary of Commerce to prepare, on behalf of the executive branch, comments on NACOA's recommendations. These comments are appended to the inside back cover of this report.

Because the field is so broad, NACOA has concentrated on those important issues where the Committee felt it could make a special contribution. In previous annual reports, NACOA discussed various aspects of Law of the Sea, development and management of fisheries and other ocean resources, development of offshore oil and gas, ocean research, coastal zone management, air pollution, weather and aviation safety, climate, weather modification, and Federal policy and organization for marine and atmospheric affairs.

In this, its Sixth Annual Report, NACOA again urges a comprehensive, planned approach to our many and varied uses of the sea and examines ways to meet this need. Because we see a gathering crisis over access to foreign oil, the availability of shipping in emergencies at a peacetime cost favorable for global commerce,

mining the deep seabed, and protecting coastal fisheries, we pay particular attention to the need for a White House-level body to develop a national ocean strategy and to coordinate the activities of the key Departments and agencies that must carry it out. This need will exist even though organizational consolidation of marine programs along lines NACOA has previously recommended were to take place. Related subjects which this report also addresses are Law of the Sea and other approaches to international cooperation in marine and atmospheric activities, offshore oil and gas, ocean engineering and research, and educating the public in marine affairs.

The report then turns to the Nation's air pollution monitoring program, to weather warnings and forecasts, and to preservation of historical weather and ocean records. Finally, in a chapter titled Status Reports, NACOA comments briefly on a number of other subjects that it has kept under review during the past year. These are aquaculture, weather modification, climate, the Coastal Zone Management Program, and the status of the GLOMAR EXPLORER.

The Committee hopes that its findings and recommendations will be of value to those responsible for managing the Nation's oceanic and atmospheric programs.

As with previous NACOA reports, this one presents a consensus of the Committee members. In addition to those whose names appear on the inside front cover as active at the time of final Committee approval, several former members continued to provide valuable assistance after their terms ended. They are Miss Edith M. McKee, Consulting Geologist; Mr. Harold E. Lokken, Manager, Fishing Vessel Owners Association, Inc.; Lt. Gen. Thomas S. Moorman, USAF (Ret.), Executive Vice President/Programs, Air Force Academy Foundation, Inc.; and Mr. Elmer P. Wheaton, Retired Vice President, Lockheed Missiles and Space Company.

SUMMARY AND RECOMMENDATIONS

Uses of the Sea: U.S. Goals in a Changing World

The United States uses the sea on a global scale for international commerce, defense, foreign policy, the extraction of living and mineral resources, and scientific research. International competition for ocean use and resource development has led to increasing and unprecedented efforts by the nations of the world to impose new constraints on traditional concepts of freedom of the seas at a time when our own dependence on the oceans is increasing. NACOA is concerned that we are ill-prepared to meet this challenge, not because the elements of an adequate response are lacking but because the marine programs and objectives of the numerous Federal agencies involved are sometimes in conflict and sometimes vague, and because effective mechanisms do not exist either to develop an overall national marine strategy or to assure satisfactory agency performance and coordination in its execution.

We also use the sea nearer home for recreation, waste disposal, coastal fishing, offshore facility siting, Outer Continental Shelf (OCS) oil and gas development, port development and management, and research and monitoring for environmental protection and natural disaster warning. In the absence of effective coordination, some of these activities are growing to the point where they threaten to preempt others or to interfere with the international uses referred to above.

The Congress, through legislation such as S. 447, modified as discussed in the text of this report, or the President should establish in the White House a Cabinet-level Marine Affairs Council chaired by the Vice President to develop a national marine strategy and to coordinate Federal agency programs for its implementation. This is needed in addition to greater organizational consolidation of agency marine programs discussed in previous NACOA reports.

Energy and the Sea

NACOA does not believe that member nations of the Organization of Petroleum Exporting Countries (OPEC) will continue indefinitely to balance the difference between U.S. supply and demand for energy unless we take drastic action to improve the balance ourselves or exert pressure on other large scale oil importers to take such measures for themselves, or both. The United States has already delayed far longer than is prudent the exploration and development of new domestic petroleum sources, including the highly promising areas of the Outer Continental Shelf. The technological means are now available to proceed safely with OCS development and the Secretary of the Interior has the authority to negotiate leases in offshore areas, but the process is not responding fast enough to meet the need.

The Secretary of the Interior should expedite the bringing of new offshore sources of oil and gas to a production-ready state. An important step is to develop offshore environmental and safety regulations clearly adequate to meet the concerns of the States and the public, that are at the same time stable, subject only to major new findings, and that provide a dependable investment climate for bidding.

The U.S. Geological Survey and the U.S. Coast Guard should jointly undertake an analysis of the human error problem as it relates to safety of offshore oil operations and establish measures for its control.

Federal support for development of nonfossil forms of energy from the sea still shows many of the problems of coordination, integration, and continuity which NACOA commented on a year ago. Key decisions are particularly needed regarding Ocean Thermal Energy Conversion (OTEC) and wave energy conversion.

ERDA's solar energy program should give priority to the advanced technology required for the Ocean Thermal Energy Conversion development program and to the systems aspects of the wave energy conversion process, where the technology is well in hand.

Marine Transportation

The last 30 years have witnessed an erosion of our merchant marine to the point where it does not now meet our commercial, national security, and defense goals as established by law. These goals themselves appear unrealistic and in attempting to meet them all, we are adequately meeting none. NACOA is not certain whether we should do more, or

whether we should do less. But, it is clear that more of the same is not good enough.

The Merchant Marine Act should be amended to update and clarify economic and military goals and priorities for the U.S. merchant marine and to provide for a proper allocation of resources in light of these priorities.

Fisheries

The Federal Government and the States have moved with speed and skill to begin carrying out the provisions of the Fishery Conservation and Management Act of 1976. This Act extends U.S. jurisdiction over living resources in waters within 200 miles of our coasts and establishes eight Regional Fishery Management Councils to promulgate regional fishery management plans and to serve as a mechanism for cooperation and coordination between the Federal Government and the States. Several important fishery issues are controversial, however, and they may slow or even stop further progress unless they are resolved soon. Among these issues are limited entry (i.e., restricting the number of vessels and the fish gathering capacity permitted to operate in a given area or on given stocks), the qualifications for appointed members of the Regional Fishery Management Councils, and permissible levels of marine mammal mortality in commercial enterprises, especially porpoise mortality in tuna fishing.

In drafting regional management plans, the Regional Fishery Management Councils should view limited entry as an eventual necessity to protect the stocks from overfishing and the consumer from rising prices to support an overcapitalized industry. However, since regional conditions differ, the Secretary of Commerce should make sure an opportunity for study and debate is provided before approving any specific regional plan for limited entry.

The Secretary of Commerce, in consultation with the State Governors, should establish guidelines for selecting appointed members of the Regional Fishery Management Councils with the broad viewpoint and experience needed to relate special interests to the public good.

The Congress should amend the Marine Mammal Protection Act of 1972 to remove inconsistencies and ambiguities which hamper efforts to regulate the killing of marine mammals.

The National Marine Fisheries Service should expand its efforts to acquire accurate data on porpoise population levels and population dynamics needed as a firm basis for regulation.

Law of the Sea and International Cooperation in Marine Affairs

Two issues under discussion at the United Nations Conference on Law of the Sea require special action if U.S. interests are not to suffer in the treaty-making process. One is the issue of international control over deep seabed mining operations. This issue is highly contentious and a workable regime is unlikely to come into effect soon. As a consequence, a potentially major U.S. industry is unable to get started, since highly qualified companies are delaying operations for lack of assurance regarding the nature and stability of the regulations which they will have to observe. The second issue concerns access to the 200-mile economic resource zones of other nations for ocean research. The United States' research program is likely to be adversely affected in important respects unless the language in the Revised Single Negotiating Text is changed.

Domestic deep seabed mining legislation should be enacted to make it economically feasible for U.S. industry to proceed with development and production of deep seabed minerals. The legislation should be clearly interim or transitional, and should include the provisions that the United States supports in the United Nations Conference on Law of the Sea negotiations now underway. Among these are environmental protection and some form of revenue sharing with the international community.

The U.S. delegation to the United Nations Conference on Law of the Sea should press for major changes in the Revised Single Negotiating Text to permit research in the economic resource zones of all countries under reasonable conditions of cooperation and sharing in the benefits of research.

The effectiveness of many of the specialized international agencies within and outside the United Nations is being greatly reduced by an increasing tendency to inject into their proceedings political issues extraneous to their primary purposes.

The State Department should reexamine and clarify the purposes behind U.S. participation in specialized international agencies and should assist U.S. delegations in providing strong leadership to refocus proceedings on matters germane to the agency charters.

Ocean Engineering

The Nation's capability in ocean engineering for civil use shows an increasing gap between the short-range solutions to specific operating problems sought by industry and the long-range background information on the oceans collected by the Federal agencies. Though NOAA has made a start towards filling this gap, more needs to be done.

The Congress or the President should take action to direct (1) the Secretary of Commerce to support and foster programs to correct major technical deficiencies in civil ocean engineering and technology, and (2) the Secretary of the Navy to provide assistance as necessary.

The Office of Science and Technology Policy should undertake a comprehensive, continuing review of the Nation's ocean engineering and undersea technology program, and should submit a periodic report to the President identifying significant technological problems and program inadequacies, and recommending remedial measures.

Ocean Research and the Academic Fleet

Much of the oceanographic research in this country makes use of the seagoing research vessels operated and coordinated by universities and other academic institutions with financial support from Federal agencies. Keeping this fleet both effective and efficient requires continued maintenance and upgrading of equipment and facilities. A long-range plan for replacement, modification, or addition of vessels is needed in which the mix of vessel size and capability and the distribution of the fleet are suited to the scientific programs of its users.

The Federal Coordinating Council for Science, Engineering, and Technology, with advice from the University-National Oceanographic Laboratory System, should develop a national plan for maintaining an effective academic research fleet, and should recommend funding and timing to implement that plan. The National Science Foundation should be designated lead agency for implementing the plan.

Educating the Public in Marine Affairs

Recognition by educators and school officials of the growing public awareness of the importance of the oceans and coastal regions and their resources has led to an interest in introducing marine concepts into elementary and secondary education. State and local educational authorities in many localities will need Federal assistance if they are to develop the wide range of new materials needed and train teachers in their use.

The U.S. Office of Education, with the cooperation of the National Oceanic and Atmospheric Administration and the National Science Foundation, should support the development of educational materials on marine subjects and their incorporation into existing elementary and secondary curricula.

The Office of Education should explore with the National Endowment for the Humanities possibilities for the development of audiovisual supplements to the "Courses-by-Newspaper" Oceans Course, suitable for school and television use.

EPA Management of the Nation's Air Pollution Monitoring Programs

Air pollution monitoring provides information about the distribution and concentration of pollutants that have been identified as hazardous to health or to the environment. There are serious deficiencies in accuracy, precision, comparability, and coverage of the monitoring data being currently collected. These deficiencies stem from the fact that responsibility for monitoring is fragmented among a number of Environmental Protection Agency (EPA) program managers and regional offices, and State and local monitoring authorities. Each of these entities makes its own decisions about how to conduct monitoring activities to meet its own needs, and quality guidelines developed within EPA are not uniformly applied. The result is that data quality and coverage vary considerably, hindering efforts to assess pollution trends and patterns across the Nation, to identify significant health and ecological effects, and to develop and assess appropriate control strategies and regulations.

The Administrator of EPA should establish an Office of Measurement Science responsible for ensuring that data collected in EPA-approved air pollution monitoring programs are of uniformly high quality and comparability, and constitute a nationwide data base capable of serving a multiplicity of purposes in addition to supporting local air pollution control efforts. This office should report directly to the Administrator.

Weather Warnings and Forecasts

The effectiveness of emergency weather warnings depends upon (1) adequate observation and communication networks, (2) proven techniques for making forecasts, (3) timely delivery of forecasts and warnings in understandable language, and (4) local officials and populace ready to respond with appropriate action. Weaknesses in these areas impede efforts to protect the public from weather disasters. There are inadequacies in meteorological observations at sea and in remote locations, and in hydrological observations on streams and rivers. Improvement is needed in the language used in forecasts and warnings, and in the means, the timeliness, and the reliability of their delivery to the public and responsible officials. There is insufficient manual backup in the event automated procedures fail. And community preparedness programs have not kept pace with population changes and increased influx of inexperienced people into disaster-prone regions.

The National Weather Service should give high priority to upgrading its emergency warning service by a combination of system redundancy and manual backup to improve the reliability of auto-

mated systems, and by the use of more readily understood language and more timely delivery of warning messages.

The National Weather Service and the Defense Civil Preparedness Agency should accelerate completion of community preparedness programs in areas of the Nation prone to weather disasters.

The Federal Communications Commission should be authorized to issue regulations requiring radio and television licensees to broadcast promptly emergency warnings of life-threatening weather conditions as part of their public service obligations.

Insufficient research on long-range weather forecasting hinders development of techniques for making useful projections of general weather conditions for the months and seasons ahead. Such projections could be valuable for agricultural, energy, and water use planning, fisheries management, and defense.

The National Oceanic and Atmospheric Administration, National Science Foundation, Department of Agriculture, and Department of the Interior should give high priority to research on long-range weather forecasting and to coordinating their efforts to provide practical applications.

Present personnel ceilings frequently do not permit the National Weather Service to provide services requested by other Federal agencies on a reimbursable basis that it could and would provide if personnel were available.

The Office of Management and Budget should make arrangements to provide the National Weather Service with the personnel needed specifically for the purpose of providing reimbursable services to other Federal agencies.

Preservation of Historical Weather and Ocean Records

Records of meteorological, oceanographic, and geophysical events, for whatever purpose originally obtained, when properly archived become valuable resources for a wide range of uses, such as studies of climate and environmental change. Insufficient effort has been devoted to maintaining these records, especially the older ones, in usable form, readily available, and protected from disasters.

The National Oceanic and Atmospheric Administration, with the advice of the community of users of environmental data, should identify those data which ought to be preserved and should develop appropriate means for their preservation. In particular, key archives of environmental data should be stored in duplicate at separate locations to reduce the risk of destruction or loss.

TABLE OF CONTENTS

Letter of Transmittal iii

Foreword v

Summary and Recommendations vii

Uses of the Sea: U.S. Goals in a Changing World .. 1

Energy and the Sea 13

Marine Transportation 21

Fisheries 29

Law of the Sea and International Cooperation in Marine Affairs 35

Ocean Engineering 41

Ocean Research and the Academic Fleet 45

Educating the Public in Marine Affairs 51

EPA Management of the Nation's Air Pollution Monitoring Programs 55

Weather Warnings and Forecasts 63

Preservation of Historical Weather and Ocean Records 73

Status Reports: Aquaculture 75

Weather Modification Research .. 76

A National Climate Program 76

Progress in Coastal Zone Management 77

GLOMAR EXPLORER 78

Appendix: NACOA Enabling Legislation 79

USES OF THE SEA:

U.S. Goals in a Changing World

Recognition that the oceans are important to the United States is now widespread and growing. How important and in what ways is not so well understood. As a consequence, we have let our means for effective use of the sea in the national interest fall behind the need. For example, there are many Federal policies regarding individual uses of the sea, but no consistent mechanism for coordinating them with each other or for relating them to the broader framework of our country's aspirations in a changing world.*

Although management of our uses of the sea offshore to the limits of national jurisdiction for primarily domestic purposes also needs improvement, it is our global use of the sea, with its international implications, that is under the greatest pressure from the rapidly changing world scene. Accordingly, the bulk of this chapter is addressed to improving this aspect of ocean policy and coordination.

Changing the Rules for Ocean Use

In many respects, we act as though it were still 1950. At the end of World War II, we were by far the world's strongest power, at sea as

---

* ". . . it is not the lack of policies that is the issue; rather, the problem is the lack of a comprehensive approach to setting ocean policies." Comments by the Secretary of Commerce on the Fifth Annual Report of the National Advisory Committee on Oceans and Atmosphere, September 22, 1976, page 4.

elsewhere. Today's world is a much more crowded and competitive place. Though our Nation is still strong, so now are many others. And we have become increasingly dependent on exports and imports to maintain our economic strength.

Ships carry all but a very small portion of the goods and materials we exchange with the other countries of the world. This has always been true, but today national security considerations are often at odds with purely commercial ones. For example, we depend on imports for more than 40 percent of our petroleum needs and for more than 50 percent of some 20 strategic materials including manganese, nickel, aluminum, tin, and zinc. This dependence is particularly troubling since by far the bulk of our imports is delivered by non-U.S. flag ships whose reliability in a crisis is uncertain and largely outside our sure control. U.S. ships carry less than 1 percent of our dry-bulk imports and 4 percent of our oil.

In addition to the increased value of the oceans as highways for commerce and as barriers to attack, they are now known to contain resources of considerable economic and strategic value. Offshore oil and gas, seabed minerals, and the sea's living resources are of growing interest to most of the nations of the world. So is the accompanying threat of pollution from waste disposal practices and safety regulations carried over from simpler and less populous times.

There is a fundamental difference between resources at sea and those on land. Land-based resources are generally under national, State, or well-regulated private control; the oceans and their resources generally are not. The investment environment at sea is more a law of the jungle where the strong survive and the weak perish, generally involving closer government-industry partnerships in other countries than in our own, with government often an investing participant sharing risks with private industry. It is time for us to decide what place our Nation will take among the major users of the sea, and to set up the appropriate arrangements to secure this place. Failing this, we can expect to see important opportunities elude us or slip away into the hands of others.

What ocean resources can mean to the United States in economic terms is difficult to forecast precisely. For one thing, it depends on assumptions regarding the extent of U.S. control over the resources, and definitions of what is meant by "economic value." Table 1 summarizes one estimate. Although not to be taken as exact, the general magnitudes appear reasonable. Table 1 indicates that the primary economic output from U.S.-controlled ocean resources was about $7.5–7.8 billion in 1972–73 and has the potential to grow to around $25 billion by 1985 and to something like $40 billion or more in the year 2000, in 1973 dollars. OCS oil and gas, food fish, marine transportation, offshore siting of

power plants, and recreation dominate the economic profile, although access to such seabed minerals as manganese may have strategic dimensions of great importance.

TABLE 1—Estimated and Projected Primary Economic Value of Selected Ocean Resources to the United States, by Type of Activity 1972/73–2000 in terms of gross ocean related outputs.*
(In Billions of 1973 Dollars)

Activity	1972 or 1973	1985	2000
Mineral Resources			
Petroleum	2.40	9.60	10.50
Natural gas	.80	5.80	8.30
Manganese nodules	....	.13	.28
Sulfur	.04	.04	.04
Fresh water	.01	.02	.04
Construction materials	.01	.01	.03
Magnesium	.14	.21	.31
Other	....	.01	.02
TOTAL	3.40	15.82	19.52
Living Resources			
Food fish	0.74	.95– 1.58	1.37– 4.01
Industrial fish	0.05	.05– .08	.05– 0.14
Botanical resources	insig-nificant	insig-nificant	insig-nificant
TOTAL	0.79	1.00– 1.66	1.42– 4.15
Nonextractive uses			
Energy	....	.58– .81	3.78– 6.03
Recreation	.70– .97	1.12– 1.50	1.64– 2.53
Transportation	2.57	4.40– 6.21	6.88–11.41
Communication	.13	.26– .36	.44– .85
Receptacle for Waste	unmeas-urable	unmeas-urable	unmeas-urable
TOTAL	3.40–3.67	6.36– 8.88	12.74–20.82
GRAND TOTAL	7.59–7.86	23.18–26.36	33.68–44.49

* Adapted from "The Economic Value of Ocean Resources to the United States," Committee on Commerce, U.S. Senate (National Ocean Policy Study), December 1974, page 5.

The protracted negotiations at the United Nations Conference on Law of the Sea (UNCLOS) have underscored the importance other nations of the world attach to the uses of the sea, and their determination to bring about new international rules of conduct at sea and new institutions to oversee them. Motives vary but there is a strong thrust towards a wider distribution of potential marine benefits, generally without a corresponding ability or willingness to contribute the capital or technology needed to produce those benefits. The UNCLOS negotiations highlight the importance to the United States of retaining our leadership in critical ocean industries and ocean activities in order to participate in the international negotiations from a position of strength while a satisfactory new international ocean regime is developed.

National Goals and Ocean Policy

Our use of the sea on a global scale invokes concepts and activities traditionally viewed as national seapower. The goals of seapower are to maintain secure access to vital resources and markets overseas, to provide the capability to project our military strength overseas and to defend the United States from attack from the sea, and to assure fair access to the resources of the sea itself.

NACOA considers it particularly important at this time to focus national attention on the modern role of seapower with its interlocking goals and its various means for their attainment, since international efforts to translate the concept of the sea as the "common heritage of mankind" into operational reality are gathering momentum and impinge on the missions of a number of Federal departments and agencies.

Access to Overseas Resources: Oil and Gas

We cannot overemphasize the fact that the overseas resource of greatest importance to us, and to which we must have access at reasonable cost, is petroleum. We share this dependence on oil imports with much of the rest of the industrialized world. While our demand is still growing, along with that of the rest of the world, there are–in our opinion–persuasive reasons to conclude that corresponding increases in OPEC* production levels may not come about. Furthermore, the international, political, and economic risks facing private investment are so great that exploration for new oil and gas reserves outside the United States is heading for a 20-year low. Without strong measures to promote conservation, or much more worldwide exploration and development,

* Organization of Petroleum Exporting Countries.

the world as a whole faces a potential shortage of energy sometime in the 1980's. It seems to us that world peace over the next 20 years may well depend on easing the energy crisis.

We are happy to see that a program to reduce our energy dependence abroad is a high priority undertaking by the present Administration. Later in this report, we will discuss in some detail the lagging Outer Continental Shelf (OCS) oil and gas development program. Our aim in so doing is to urge a change in policies that we think have unnecessarily slowed some partial though important solutions to meeting our need and lessening the prospects of deadly conflict.

Shipping

Shipping is obviously an essential component of national seapower. While the U.S. merchant marine has been in decline, along with those of a number of other nations, the Japanese shipbuilding industry and the Soviet merchant fleet, working in close cooperation with their respective governments, have risen to world leadership in building and operating ships and have in combination had a significant impact on the maritime industries of many other nations. Japan, of course, imports virtually all its raw materials by sea and its need for assured transport is clear. But the Soviet Union, which imports little as a general rule, has since World War II developed its merchant fleet apparently for foreign exchange and geopolitical reasons. Its merchant fleet brings in hard foreign currency, and the Soviets usually underbid other shipping lines to capture the market regardless of profit in order to establish friendly relations with many of the developing countries throughout the world and to create dependency on Soviet shipping.

Other countries with overcapitalized merchant fleets are beginning to establish policies requiring that exports and/or imports be carried in local bottoms. There are indications that some of the large oil producing countries are considering establishing their own tanker fleets so that they can deliver their own oil without regard to cost or politics.

This situation is independence gone wild, with prospects ranging from "beggar thy neighbor" competition among flag fleets to supranational private combines beyond any effective national control. Within the United States the situation is further complicated by the standby defense requirement for our merchant marine and other categories of shipping which we presume will be available and subject to our control in time of need.

Accordingly, NACOA returns to one of its earliest recommendations*

---

* First Annual Report to The President and to The Congress. National Advisory Committee on Oceans and Atmosphere, June 30, 1972, page vi.

in urging a thorough and comprehensive review of our national marine transportation policies and practices in light of the extent to which our national security–with its economic, political, industrial, and military dimensions–is bound up in this classic component of seapower. A subsequent chapter on marine transportation attempts to lay the groundwork for such a review. An effective national seapower policy must have a more reliable shipping component than we now have, and it must take a broader national perspective than has yet been applied to the issue to deal adequately with all its dimensions.

The Navy

The military component of our seapower is also having to adjust to new realities. The centers of global military power around which we have evolved our foreign and defense policies over the last 30 years do in most part still exist. The mutual possession of nuclear weaponry and missile technology still imposes a high degree of restraint on direct confrontation between potential adversaries by the power and the dispersed and hidden location of the weapons. Vietnam and the Middle East suggest practical limits to big power military involvement in smaller nation conflicts.

This constraint on major powers may encourage the emerging nations to press aggressively for rapid attainment of their military and economic goals. The oceans in particular are becoming a testing ground of national resolve and international cooperation in developing a working definition of "full and fair use of our planetary resources" which is as acceptable to us as it is to the developing nations. Whether international efforts to realize collective marine goals will lead to a common understanding or to international conflict is still uncertain. However, progress towards mutual disarmament and a new Law of the Sea agreement has, to date, been less than encouraging, leaving a strong defense posture a continuing strategic imperative.

Our naval forces are now engaged in major decisions affecting the structure of the fleet and its operational strategy. These involve the types of capital ships, global deployment concepts, the means for patrolling ocean areas, and the availability of fewer reliable foreign bases. All will have major impact on our naval capabilities through the end of the century.

The resolution of these questions about the form and function of the future Navy should not be made in a purely wartime context. The structure of the fleet must also answer to its peacetime role as a stabilizing influence wherever resources vital to our needs are produced and

along the routes by which they are delivered. To our knowledge this latter responsibility is not being addressed in the broad seapower context we are discussing here.

Fisheries

Another resource whose importance creates the potential for serious international conflict at sea is fish. The tremendous growth in worldwide catch since the early 1950's has begun to endanger many species. At the same time, a number of world powers, in addition to a variety of smaller nations, have become dependent on fish as essential to the national diet. To mention only the most significant example, since World War II the Soviet Union has moved decisively to obtain protein for its people by fishing the world's oceans, having concluded that protein is obtainable more readily and at a lower cost from the sea than from a troubled agricultural sector. The enormous Soviet fishing industry, developed over the past 2 decades, is now the largest in the world next to Japan. The Soviet fishery does not operate as a private competitor in the marketplace, but as a completely subsidized industry, meeting Soviet needs both for protein and for hard currency.

The United States has taken action, through enactment of the Fishery Conservation and Management Act of 1976, to protect the fishery resources off our coast with due regard for the needs of other nations traditionally or heavily committed to their use.

An effort is being made by our delegation to the United Nations Conference on Law of the Sea to incorporate provisions for access by other nations to coastal species which the coastal nation is unable to exploit fully and to reserve anadromous species for the host nations in which they reproduce.

International Cooperation

State Department activities, especially those involved in the current and drawn out efforts to negotiate a wide-ranging Law of the Sea treaty, have a pervasive bearing on the prospects of effective deployment of U.S. seapower and its success in reaching its goals. U.S. objectives being sought through this process are of extraordinary importance. Ambassador Richardson, Special Representative of the President for Law of the Sea, stated in testimony before the Congress on May 12, 1977,*

---

* Testimony of Ambassador Elliot L. Richardson, Special Representative of the President for Law of the Sea before the U.S. House of Representatives Committee on Interior and Insular Affairs, Subcommittee on Mines and Mining, May 12, 1977.

"The U.S. . . . has a number of objectives at the Law of the Sea Conference. Among these, we seek to:

–provide a framework of law within which competing oceans uses can be accommodated;

–preserve high seas freedoms, including navigation and similar uses in the 200-mile Economic Zone;

–ensure unimpeded passage through and over straits;

–maintain maximum freedom of scientific research;

–provide a framework for protecting the marine environment;

–establish a comprehensive dispute settlement mechanism; and

–establish an international regime and organization for mining the deep seabeds which assure nondiscriminatory access under reasonable conditions for U.S. miners."

These goals, as well as the fishery goals discussed earlier, are too important to abandon, though some are more urgent than others. But failure to achieve them through a universal LOS treaty should not stand in the way of arriving at them through other means. Bi- and multilateral agreements, arrived at by direct negotiation or through existing or new international organizations established for special purposes, is one option. Failing this, and depending on the importance and urgency of the issue, we might take interim unilateral action in the same fashion as that leading to the Fishery Conservation and Management Act of 1976.

It should be clearly recognized that the LOS and other treaties are not ends in themselves for which other goals may be treated as bargaining chips, as has been assumed in recent years, but that these agreements are among the various ways of making seapower effective in moving towards larger national goals.

Other Key Seapower Agencies

For completeness, we should mention the other Federal agencies with major parts to play in the development and application of seapower. The multimission U.S. Coast Guard is the major Federal agency for marine safety, law enforcement, regulation, and navigational aids. Like the State Department, its involvement so pervades the operations of the other elements of seapower that they can hardly be considered without some reference to the Coast Guard. Even in times of national emergency, the Coast Guard–like our merchant marine–has a support role for which it must prepare in peacetime. Its planning for the future is relatively sophisticated and comprehensive. Whether it will obtain the needed resources for its enlarging role is a question. We continue to urge that it should.

The programs of the National Oceanic and Atmospheric Administration in ocean resource management and global environmental observation, prediction and applied research, along with the marine resource programs of the Department of the Interior and the ocean research programs of the National Science Foundation, are not sufficiently planned or funded from the point of view of a unified national seapower policy. Some of these will be commented on in later sections.

Managing the Nation's Seapower

Our recommendation is that much of the Nation's marine activity be explicitly recognized as a unique and important means for furthering national interests on a global scale and that it be developed and managed specifically to further the following interrelated ends:

- access to foreign sources of vital materials and markets;
- availability of marine transportation to meet our needs for world commerce;
- access to and fair-share use of marine resources;
- protection of the marine environment;
- projection of military capability overseas when required;
- protection of the United States and U.S. offshore activities from hostile action and attack;
- military marine research and engineering development efforts to avoid technological surprise in areas of military importance; and
- an informed public willing to provide the funds and support the programs needed.

The Navy, Department of State, National Oceanic and Atmospheric Administration, Maritime Administration, Coast Guard, Department of the Interior, and the National Science Foundation are the key entities presently responsible for major components of seapower. Because so many agencies are involved, each with its own primary mission, policies governing the overall development, implementation and coordination of seapower programs to serve the overall national purpose should be developed and coordinated at a higher level. Although several alternatives are possible, such as a subgroup of the National Security Council or a Cabinet-level interdepartmental committee chaired by a Cabinet member, we believe this purpose would best be served by establishment of a Cabinet-level Marine Affairs Council chaired by the Vice President. Such a Council is provided for in a bill (S. 447, the Marine Science, Engineering, and Resource Development Act of 1977) introduced in the current Congress by Senator Humphrey who, as Vice President, chaired a similar body in 1966–1969. However, it should be modified and retitled to make clear that the Council's scope includes coordinating

all marine policies, planning, and operations which have a global impact, not just those pertaining to marine science, engineering, and resource development. Enhancing national security and maritime commerce should be added to the goals listed in the current version of the bill. Alternatively, such a body could be established by Presidential initiative.

National Policy for Offshore Management

The emphasis placed on seapower for global use in this report is not intended to obscure the need for a comprehensive and coherent approach to managing domestic activities in our offshore areas. As we have pointed out in each of our previous reports, increasing use of the sea nearer home for domestic purposes such as recreation, waste disposal, offshore facility siting, and OCS oil and gas exploration and production is leading to increasing mutual interference and conflicts with other domestic goals in the coastal zone and near-shore waters.

Specific goals of domestic uses of the sea include:

- profitable use of marine resources by U.S. industry;
- public access to marine recreation;
- efficient and safe ports, waterways, and sealanes;
- waste disposal compatible with other uses;
- offshore siting of power plants and other facilities where economy and safety permit;
- environmental protection; and
- balanced, multiple use management of coastal and offshore areas.

We continue to recommend that planning for ocean use management, involving the balanced development of offshore resources compatible with environmental and coastal zone goals, be specifically identified as a function of the Marine Affairs Council referred to previously or delegated to a lead agency with the requisite capability. NOAA is, at the present time, the closest approximation to such an agency.

Summing Up

To sum up, seapower aims at helping assure U.S. access to vital sources of materials and markets overseas. It relies today, as it has traditionally, on marine transportation and a strong Navy to protect it. In addition, it should promote efforts to find and exploit the oil, mineral, and fishery resources of the sea itself, with strong encouragement to new industry, new technology, and new forms of protection and defense. It should undertake to develop an informed public willing to support the necessary programs. Finally, it must deal with new obstacles: claims to jurisdiction over marine resources or oceanic regions by many nations;

increased ship traffic and safety control problems; law enforcement responsibilities of greatly expanded magnitude; and a vastly increased number of nations actually pursuing their own version of seapower where in ages past there were at most a handful.

The challenge to our leadership is great. The rewards for our success can also be great, not only in economic terms but in social and geopolitical terms as well. No other nation has quite our opportunity to lead the world into a new and more stable age where cooperative solutions to common problems can become the norm. Seapower—new style—can perhaps help pave the way.

Energy and the Sea

In past annual reports, NACOA has urged expediting exploration and development of Outer Continental Shelf oil and gas as an important element in a national energy program. Worldwide energy trends make it ever more urgent; technology now in hand can make it safe. Yet we are still holding back while seeking to satisfy continually escalating concerns about the environment and about possible adverse impacts on the coastal States. We feel this delay could turn out to be a grave mistake.

We are deeply concerned over a policy which relies on the nations of the Organization of Petroleum Exporting Countries (OPEC) to furnish ever increasing amounts of oil to industrialized nations at noninflationary prices indefinitely. Not only is this out of the question for the long term, but we believe that OPEC's immediate self-interest will almost certainly lead to economic rationing through price increases or physical rationing through production limitations, or both, within the next 10 years. Failure to develop by then a cushion of additional domestic sources of oil and gas along with alternative forms of energy and an effective conservation program will leave only unacceptable options should OPEC follow this likely course. The United States would then have to choose between such prospects as an economic crisis or maintenance of U.S. imports of Middle Eastern and other foreign crude oil by coercion or force. In other words, continuation of the status quo is a threat to world peace.

Supply and Demand

Although the United States is not the only industrialized nation heavily dependent on imported oil for its economic viability, we import the most, and our role in the world marketplace will continue to dominate the demand side of the balance of supply and demand. The controlled economy countries such as the Peoples Republic of China and

the Soviet Union could conceivably supply energy to the West, but there is no solid evidence of such a potential. For many years to come OPEC, and specifically Middle East, production and pricing will dominate the supply side of the equation.

OPEC nations today control roughly two-thirds of the world's proven production capacity for petroleum and probably hold the only free world reserves that can be significantly expanded to avoid a worldwide shortage of energy during the next 10 to 15 years. NACOA does not question that energy is available in the world community, but a look at the economics, the changes in the lifestyles, and changes in the foreign credit status of OPEC nations leads us to the conclusion that to continue to supply the world's needs on today's terms is not their most likely course. The needs and wants of the OPEC sellers appear incompatible with the needs and wants of the industrialized buyers.

The OPEC Factor

Contrary to the general impression of the public, OPEC is not a single monolithic entity, either politically or culturally. Its usefulness as a power base for competing with the industrialized nations of the world gives it what unity it has. Within OPEC there are many forces at work which have led to open differences of opinion among the members on the pricing of oil.

Those such as Iran that are pushing for large price increases are in essence aiming to stretch out the life of their reserves by forcing the industrialized world into rationing to deal with continued price increases. Such a pattern of economic rationing will divert a higher and higher percentage of the world's wealth to OPEC treasuries while at the same time extending the span of time over which they can count on supporting themselves on this commodity. The nations in OPEC that favor this type of economic rationing generally have large populations and depend heavily on oil sales for income. Their annual per capita income from oil ranges from less than $100 to $1,000 (in 1975 dollars at $12 per barrel). The U.S. gross national product per capita is around $6,000, to provide a comparison that is a rough index to the difference in living standards.

In addition to the pressure of immediate self-interest, leaders of many of these nations feel that their lands have been plundered by the industrialized West for the last 20 years by removing oil at an inequitably low price, leaving them inadequate foreign exchange to buy back from the Western World the goods and services made in factories using energy taken from their shores by what they believe to have been economic piracy.

On the other hand, there is another block of OPEC nations whose

oil income equals or considerably exceeds the entire industrial output of the United States on a per capita basis. In these nations, the oil income has risen faster than their populations can spend it efficiently or adapt to the changes brought about by it. They have an entirely different set of problems. Of this group, Saudi Arabia is the best example.

In the last 3 years the Saudi government has been struggling to handle a 14-fold budget increase for defense, administration, industrialization, and social projects. Already, a number of industrialization projects have had to be delayed for reasons of feasibility and efficiency. In addition, the people of that nation are having to make cultural adjustments brought about by industrialization. It has not been easy for the ordinary citizens of Saudi Arabia to accept so rapid a change in their traditional way of life and to learn to cope with the complexities of an industrial society. The Saudi government is clearly aware of the cultural adjustment problem and has slowed the pace of internal development for this reason also.

Saudi self-interest would suggest a policy of limiting production to produce a balanced budget. On the other hand, Saudi Arabia appears to be sensitive to the needs of the Western World. They clearly do not want to see an energy-starved, inflation-ridden industrialized West beset by a severe imbalance in foreign exchange, and there seems to be little doubt that Saudi Arabia values the friendship of the West.

While we may hope for—and encourage—the dominance of the moderates in OPEC, it would be unrealistic to deny that prospects of either physical or economic rationing from OPEC loom larger and larger. Therefore, the need for the United States to develop secure sources of oil and gas to reduce its dependence on OPEC seems ever more urgent from the standpoint of national security, economic stability, and world peace.

OCS Exploration and Production

The finding rate for oil and gas in the United States is steadily dropping in the most explored areas. The only unexplored areas that are geologically attractive are in Alaska and offshore on the Outer Continental Shelf. Most of this region is under control of the Federal Government for leasing and development. Only a small portion of the Outer Continental Shelf of the United States has thus far been opened for development, in spite of the fact that over the last 10 years the finding rates for both oil and gas offshore have been 10 times greater than the finding rates onshore. A national projection of supply that includes this offshore acreage should allow for the fact that the lead time for a major oil and gas development offshore is at least 5 to 7 years. In fact, oil from Alaska's North Slope is just now reaching the market after 10

years, and the availability of additional resources from the Alaskan Outer Continental Shelf or Federal land reserves in Alaska appears to be still far off in the future.

NACOA urges again that the Secretary of the Interior give vigorous leadership to efforts to shorten the time required to develop offshore oil while satisfying environmental and State government concerns. We believe the industry would respond favorably even to regulations which are on the overprotective side, provided they are stable and unlikely to be revised upward abruptly or arbitrarily. The OCS areas should at least be developed for national emergency purposes. The minimum requirement is to have them ready for immediate use if needed.

As in previous annual reports, NACOA advises against the establishment of a government exploration or production agency, as has been proposed by some. We believe that oil and gas resources will be most quickly found and efficiently developed if private industry continues its role in exploration and production and the government continues to provide guidelines and regulations.

Progress with Safety

On the other hand, NACOA would be remiss to recommend accelerated development without again addressing the matter of blowouts and oil spills, as well as the safety of pipelines for transmission from offshore facilities to onshore processing systems.

In NACOA's Fifth Annual Report, we urged avoidance of adversary proceedings between the oil industry and government in arriving at agreements on environmental protection. Such conflict serves only to increase delay and mutual mistrust. NACOA stated then and repeats now its belief that equipment, instrumentation, and safety devices are available to bring oil drilling and production to an acceptable level of safety relative to other hazards in an industrialized society.

NACOA does not perceive the key problem in offshore safety to lie in equipment or technology, but rather in the risk of occasional human error in utilizing that equipment. Although improved design can perhaps reduce further the possibility of personnel error, a preponderance of failures appears traceable to crew or supervisors not following prescribed operational sequences or having previously failed to do routine preventive maintenance on safety equipment. The oil companies have carefully designed operational procedures, but field personnel are sometimes lax, or believe that the recommended procedures are overly cautious and disregard them.

There are ways to increase the professional discipline of operating personnel. One is to require licensing or certification of supervisors in the same way that a flight engineer or pilot is licensed. Awarding and

renewing a license can involve testing the person's knowledge of proper safety and emergency procedures as well as knowledge of the new developments in equipment and operational procedures.

Unless this or some similar method is applied to the personnel factor, NACOA does not believe that all the safety equipment in the world will prevent a blowout any more than all possible instrumentation on an airplane can prevent a crash if the pilot fails to use it as intended. Accordingly, we recommend that the U.S. Geological Survey and the U.S. Coast Guard, which share responsibility for establishing and enforcing safety regulations, undertake jointly to analyze the human error problem as it applies to these operations and to develop a program for its control.

For the past several years, plans for offshore leasing in new areas have been postponed to complete arrangements between the Federal, State and local governments on impact compensation, land use, and how State, local and Federal authorities shall share decisionmaking power. Based on progress made in NOAA's Coastal Zone Management Program, and proposed amendments to the OCS Lands Act, we believe that the coastal zone management effort is now becoming an effective safeguard to local interests and that there is no reason to further delay leasing.

Without active Federal leadership toward national energy objectives, we fear the offshore leasing program will continue at a snail's pace. Viewed locally, there is often little incentive to act since, in spite of all the talk, there are no lines at the gasoline pumps—yet—and people don't want oil rigs off *their* beaches. The key here, we believe, is to make sure that leasing terms provide the protective regulations needed to satisfy local citizens and State and local governments and then to use the Federal authority to press ahead. However tough the regulations may seem to industry, they can be priced by bidders as part of the cost of the lease. We do not think that tough regulations will cause bidders problems unless terms or specifications are changed frequently or arbitrarily. It is uncertainty about the rules and their stability that disrupts long-term investment planning.

Accordingly, NACOA urges the Secretary of the Interior to develop, for incorporation into requests for bid, offshore safety and environmental regulations that are clear, specific, and unlikely to change abruptly or frequently. NACOA believes that such an approach will allow the development of oil and gas on the Outer Continental Shelf to proceed with the knowledge needed by the bidder to take into account financial considerations involved in environmental protection, operational safety, and the prevention of oil spills.

Nonfossil Energy from the Sea

The subject of nonfossil energy from the oceans is still rather poorly understood in governmental circles. Some progress has been made by the Energy Research and Development Administration (ERDA) in program analysis and planning during the past year, but programs that have been initiated have been marked by problems of integration and continuity. In our Fifth Annual Report, we reviewed the technical situation. In this report, we wish to call attention to the possibilities that seem to us to deserve priority attention.

There are a number of approaches to extracting nonfossil energy from the oceans. These include utilizing wave motion, tidal motion, temperature differences between upper and lower layers of the ocean, salinity differences between ocean water and fresh or brackish waters, and marine plants processed into convenient forms of fuel.

To utilize temperature differences, heat engines would make use of the 20° C difference between surface water and deep water in the Tropics. For wave energy, various devices would convert the kinetic energy of surface motion to other forms of energy. To utilize biological sources, kelp or other marine plants would be processed to yield alcohol as a fuel or fuel extender.

Other than tidal energy, all the other possibilities mentioned above are forms of solar energy and are the responsibility of ERDA's Division of Solar Energy. The Division's major ocean program is Ocean Thermal Energy Conversion (OTEC) development, which makes use of the difference in temperature between the upper and lower ocean layers as the driving force. The heat stored in the upper layers is maintained by the sun. The attractiveness of ocean thermal energy is that the ocean is a natural collector and reservoir of solar energy, and thus, the collector problem which is associated with photoelectric methods, as well as storage problems that are so acute for windmills and other converters are eliminated.

Wave energy is very attractive because of its ubiquity and scale. The problem of storage to assure availability does exist but is not as acute as for the windmill. In fact, the waves can be regarded as the equivalent of a wind energy converter with better time characteristics than windmills. In addition, wave energy conversion requires no technology breakthroughs, but rather system development and integration. ERDA maintains contact with the British program in wave energy conversion but this is small, of the order of $5 million total over the past several years.

A third use of the ocean for a form of solar energy is through converting its biomass built up by photosynthesis. For useful application, biomass conversion to some useful fuel like methanol would be interest-

ing. This is controversial for two reasons. The marine plant under consideration is the fast-growing giant kelp. However, if available in amounts greater than currently harvested quantities, it would almost certainly continue to be used for the derivation of valuable chemicals worth 10 or so times more than its value as a fuel equivalent. Moreover, there is enough biomass on land available today on a renewable basis to make a large impact on the energy equation if used the same way. It would seem better economic policy to develop a terrestrial biomass-based fuel economy to a high level (which would in itself be a major and beneficial accomplishment) before worrying about additional marine sources of biomass for energy conversion. Further, it is likely that additional increments would more economically come from production on land than at sea. This is not to be interpreted as pessimism with regard to biomass as an important contributor to our energy program, but rather that the oceans are not the place to look first.

The entire field of ocean nonfossil forms of energy has not advanced very far. It is time to focus on the most important aspects of the most promising alternatives. To summarize, these are the heat exchangers, the engine, and the environmental aspects in the OTEC program, and the systems aspects of the less sophisticated wave energy conversion programs. Yet the OTEC program, the centerpiece of ERDA's ocean program, is moving ahead slowly and the wave energy program hardly at all. We recommend that ERDA tackle these problems before more valuable time is lost.

Marine Transportation

Transportation is one of mankind's most important uses of the sea. In a world that depends increasingly on international trade in raw materials, oil, natural gas, chemicals, food, and manufactured goods, seagoing commerce now carries practically all of the cargo flow among the continents. The world's merchant fleet has grown in tonnage from 80 million in 1948 to more than 550 million in December 1975. It is likely to quadruple in the next few decades. Paradoxically, the U.S. position as a maritime power has been deteriorating over the last quarter century. Federal maritime policy has succeeded only in slowing the decay.

NACOA is disturbed by the continuing national maritime problems, and is particularly uneasy about their possible effects on our national security. NACOA believes that the national maritime issues, sensitive as they are, must be forthrightly addressed.

The Merchant Marine Act of 1936, as amended, sets forth the present national policy:

"It is necessary for the national defense and development of its foreign and domestic commerce that the United States have a merchant marine

(a) sufficient to carry its domestic water-borne commerce and a substantial portion of the water-borne export and import foreign commerce of the United States and to provide shipping service essential for maintaining the flow of such domestic and foreign water-borne commerce at all times,

(b) capable of serving as a naval and military auxiliary in time of war or national emergency,

(c) owned and operated under the United States flag by citizens of the United States insofar as may be practicable,

(d) composed of the best-equipped, safest, and most suitable types of vessels, constructed in the United States and manned with a trained and efficient citizen personnel, and

(e) supplemented by efficient facilities for shipbuilding and ship repair.

It is hereby declared to be the policy of the United States to foster the development and encourage the maintenance of such a merchant marine."

The Act requires the Secretary of Commerce to determine what additions and replacements are needed to enable the merchant marine to meet these objectives, and to develop a long-range program for their acquisition. The Secretary is to cooperate closely with the Navy Department concerning national defense needs and the possible speedy adaptation of the merchant fleet to national defense requirements.

U.S. Maritime Posture

NACOA has conducted an initial review within the framework of the national objectives listed in the Merchant Marine Act. Our assessment to date has led us to these interim conclusions:

- the U.S. merchant marine does not at present meet the goals laid out by the Congress over 3 decades ago, nor is it realistic to expect that these goals will be met under existing legislation;
- our merchant marine is clearly not even carrying a substantial part of our foreign trade;
- despite $7 billion in Federal funds for various kinds of support for the merchant marine since 1936, it is in what appears to be an extended and continuing decline;
- the number, types, and readiness of U.S. merchant vessels appear inadequate to meet defense goals;
- the National Defense Reserve Fleet is an important national asset, but it is aging and plans for its continuation are inadequate for meeting national needs in the next 2 decades;
- reliance to any significant measure on the Effective U.S. Controlled (EUSC) Fleet may be a high risk national policy; and
- the program for installation of national defense features on merchant ships appear inadequate to meet national defense needs.

In short, despite some progress resulting from the Merchant Marine Act of 1970, our maritime posture for stated purposes of national secu-

rity and national defense in unsatisfactory.* The urgent question is at what level of decline does the situation become unacceptable.

We do not intend to review the history of U.S. merchant marine policy.** Our purpose is to highlight some of the problems with U.S. policies that over time have adversely affected our merchant marine.

Thomas Jefferson, as Secretary of State, outlined some thoughts on the merchant marine in a report to the Congress on December 16, 1793. We believe they still have relevance.

> "As a branch of industry (our navigation) is valuable, but as a resource of defense, essential . . . In times of general peace it multiplies competitors for employment in transportation, and so keeps that at its proper level, and in times of war—that is to say, when those nations, who may be our principal carriers, shall be at war with each other—if we have not within ourselves the means of transportation, our produce must be exported in belligerent vessels, at . . . increased expenses . . . and the articles which will not bear that must perish on our hands."***

The merchant marine serves both the nation's commerce and its defense, but it does not necessarily follow that its importance and value is the same in both arenas. It seems obvious that we need our own ships in time of war, but it is not certain to what degree our commercial interests and peacetime national security are put in jeopardy by reliance on foreign flag shipping. It may be that when assessed from a perspective that includes both, the role of the merchant marine in augmenting military transportation capabilities in times of war will turn out to be quite different, with different needs and priorities, from its contribution to peacetime commercial strength and economic independence.

The current merchant marine policy is not adequately serving our multiple purposes. The steps taken to strengthen the peacetime mer-

---

* We view national security as encompassing the broad economic, social, industrial, and political welfare of the country. Specific aspects of our overall national security are directly addressed by national defense. At times, of course, national defense is a dominant segment of national security.

** Such a review may be found in "Congress and the Oceans: Marine Affairs in the 94th Congress," Committee on Commerce, Science and Transportation and National Ocean Policy Study, U.S. Senate, June 1977, pages 141-189.

*** Quoted in "Report on Oversight Hearings before the Merchant Marine Subcommittee with Respect to U.S. Flag Merchant Marine," U.S. House of Representatives Committee on Merchant Marine and Fisheries, Serial No. 94-N, 1977, page 2.

chant marine are not completely meeting our wartime needs, and vice versa. Legislative remedies to strengthen our merchant marine such as trade agreements are more likely to succeed if they address clearly defined areas of weakness affecting specific national purposes than if they attempt across-the-board strengthening of the merchant marine as a whole.

Addressing our current maritime objectives in light of these and other related questions is a complex matter and we have thus far made only a start. We have not specifically commented on many of the factors affecting the present situation such as labor/management interaction, ship operating costs, and subsidies. We have to date focused on the objectives of the merchant marine program. This initial and rather brief review, however, has led to some basic findings and recommendations.

Policy—Purposes and Priorities

The various purposes of our merchant marine are being addressed individually, but not in a way that takes full account of their cross-impacts. Agency programs may advance agency goals and objectives, but without policy and priority guidelines assuring a purposeful effort overall, may still fail both individually and collectively. The foreign flag tanker problem, the slow and rather late evolution of offshore deepwater port development in the United States, the insufficient defense shipping preparedness, the great reliance on non-U.S. shipping for ore and bulk shipments, the general lack of modern port traffic control systems, and a host of other problems—can be traced to our failure to deal with national maritime related questions at a level capable of resolving incompatibilities among the many agency programs needed to fully implement an overall national marine transportation policy. Time alone will not cure this problem. Nor is the problem interagency communications per se, which we find are quite extensive.

That the Administrator of the Department of Commerce's Maritime Administration (MARAD) has central responsibility for U.S. merchant marine policy is clear.* What does concern us, however, is where the authority lies to deal with the full range of maritime problems whose solution depends on activities within many agencies and a widespread common view of maritime concerns from a perspective broader than that of individual agency goals and objectives. NACOA believes that this authority is nowhere assigned or exercised. We believe that there

* Senate Report No. 91-1080, Committee on Commerce, accompanying H.R. 15424, a bill to amend the Merchant Marine Act of 1936, August 10, 1970, page 64.

should be a point within the executive branch not identified solely with U.S. shipping interests, where a coherent policy tying together domestic and military shipping needs, port considerations, and other similar purposes can be developed and related to the full range of national goals that are dependent on marine activities. We have suggested in an earlier section the establishment of a Marine Affairs Council chaired by the Vice President to serve as this central point. Until such a council is established the National Security Council (NSC) is probably the most suitable body to oversee an assessment of marine programs needed for national security and defense. To assure full agency input and sustained interest, the NSC should consider establishing a standing interagency committee on Federal maritime policy to help it plan and coordinate a coherent Federal maritime program.

We believe also that it is time for the Congress to reexamine the premises underlying present maritime programs and purposes. It seems highly likely that further legislative remedies to our present maritime deficiencies are needed.

Defense Requirements

The need for U.S. ships of specific capabilities to supplement military vessels during wars or other emergency situations is obvious, but is inadequately defined at the present time. We currently attempt to meet our defense requirements in a number of ways, three of which we shall discuss here—the National Defense Reserve Fleet (a fleet of older vessels owned by the U.S. Government and kept in "mothballs" in a state from which they can be brought to operating condition within specified periods of time); the Effective U.S. Controlled Fleet (a fleet of U.S.-owned vessels sailing under foreign flags and subject to contractual agreements placing them under U.S. control in certain emergency situations); and the installation of defense related features (at Federal expense) on merchant vessels. The trend toward containerization in commercial shipping has ramifications for defense and will also be briefly addressed.

The Reserve Fleet

The 1946 Merchant Ship Sales Act was a mechanism for disposing of our wartime merchant fleet while reestablishing our national capacity for maritime commerce. The Act established a National Defense Reserve Fleet (NDRF) to retain in reserve those vessels thought necessary for our future national defense. The NDRF has fallen from a high of 2,227 vessels in 1950 to 344 on March 31, 1977. The fleet is quite old, with its present elements (mainly World War II Victory ships and Seatrain-type vessels) averaging over 30 years of age. The NDRF has

been a logistic supply line for each military action that we have been involved in since World War II. The concept of maintaining a fleet of ships in reserve for national purposes is sound and we believe it is an essential element in assuring that defense needs are met.

The National Defense Reserve Fleet should be maintained in proper condition for rapid crisis response. Sharp intense conflicts such as the 1973 Arab-Israeli War consumed supplies and equipment at a prodigious rate. In such conflicts the luxury of a slow buildup period is unlikely, and rapid and ready sea and airborne logistics are clearly a national necessity.

Plans are underway within the Maritime Administration and Navy to assure that a limited number of vessels in the NDRF are maintained in a state of high operational readiness, with full activation possible within a 5- to 10-day time period. We strongly support this program as a means to assure ready and known availability and known capability at a reasonable cost.

The Merchant Marine Act of 1970 provides for building up the NDRF by means of trade-ins to the fleet as particular vessels approach commercial obsolesence. Unfortunately little updating of the fleet has occurred since. The National Security Council should review the specific defense requirements for this fleet including number and types of ships and degree of readiness needed to meet our security needs to the end of the century, and should determine whether current plans for maintaining the fleet are adequate to meet national needs.

The Effective U.S. Controlled (EUSC) Fleet

The Effective U.S. Controlled (EUSC) Fleet consists of over 400 foreign flag, foreign manned vessels owned by U.S. citizens and subject to U.S. use in national emergencies under arrangements with MARAD. The reliability of this fleet is unknown. We believe that undue reliance on these vessels for security and defense purposes is poor national policy and is indicative of other weaknesses in our national maritime program. The EUSC Fleet is primarily a tanker fleet of low utility for general military resupply, more appropriate in makeup for support of industrial and civilian needs than for military support. The EUSC Fleet should be viewed as an expedient needed because weaknesses in other forms of shipping do not permit a better strategy, at least for the present.

Federally-Funded Installation of Defense Features on Merchant Ships

Less than 0.6 percent of the construction-differential subsidy funds awarded since 1958 has gone for the installation of national defense

features. This figure alone may indicate that defense features are not being placed on merchant vessels in a manner to comply with the purposes of Section 210 of the Merchant Marine Act of 1936. It appears that there is some basic incompatibility between the desire to include defense features aboard ship, and the desire to maximize commercial competitiveness. Some defense features do present obvious problems for commercial operations. Among these are helicopter pads, spaces designed for military hardware, overhead clearances, mounts or mount space for weapons, fast-pumping capability for fueling, speed requirements, communication capabilities, strengthened decks, heavy lift features, system redundancies, cranes and mountings, self-support loading and unloading capabilities, and compartmentation.

MARAD is charged with promoting the merchant marine. It must, as well, fund national defense features out of the construction-differential subsidy funds. But major defense modifications can work at cross purposes with commercial objectives. The reasons for the modest size of the defense feature installation program and its ultimate impact on national security should be addressed by the NSC in connection with the review of Federal maritime policy which we recommended earlier.

Containerization

Because the U.S. military supply system relies heavily on the commercial fleet for its logistic support, it must adapt to current commercial shipping practices and port intermodal systems. Of particular significance is the need to adapt to containerization. While there are many commercial advantages to containerization, they do not always apply to military operations. Even though over 70 percent of our military cargo movement is now containerized, problems do exist. They include, for example, specialized container availability, resupply at sea, operations in areas without container handling capabilities, and others. In addition, a significant Navy and Marine Corps problem is the support of amphibious and other beach operations from containerships. The operational difficulties are many, and efforts have been made over the last few years to develop offloading and "over-the-beach" hardware and techniques to effectively interface the containership with beach operations.

While the problems associated wtih containerization are important, NACOA is not prepared to offer recommendations at this time. A number of research projects presently underway within the Department of Defense are expected to shed light on the pros and cons of the various options, and we feel that any recommendations from NACOA should await completion of these studies.

Fisheries

The year 1976 was one of dramatic change in the management of living resources in the offshore waters of the United States. Public Law 94-265, the Fishery Conservation and Management Act of 1976, extended U.S. jurisdiction over fishery resources in waters adjacent to our coasts to a distance of 200 miles, and in the case of anadromous species throughout their range, short of waters under the jurisdiction of others. The law also established eight Regional Fishery Management Councils and made them responsible for drafting and implementing fishery management plans for all fisheries within this zone upon approval by the Secretary of Commerce. Enforcement provisions of the Act became effective on March 1, 1977. The rapidity with which the management system was put in place is remarkable.

Limited Entry

The Act is designed to conserve fishery resources off the coasts of the United States by putting them under U.S. management authority, and to give American fishermen a preferential opportunity for their utilization. However, NACOA sees the eventual demand for these fish inevitably exceeding the supply. Projected increases in U.S. population, along with increased leisure time for recreational fishing, are certain to push the fishing effort beyond the point of net economic gain and even to threaten the resource, unless it is kept within bounds. NACOA believes, therefore, that access to the fisheries will ultimately have to be limited even for U.S. fishermen.

Limited entry—restricting the number of vessels and their capacity permitted to operate in a given area or to fish specified stocks—is a regulatory measure which experience has shown is generally necessary where common property resources are concerned to prevent overcapitalization of the industry and the resultant heavy pressure on the resource

and rising prices for the consumer. Although it is resisted by many as foreign to our traditional acceptance of free access to fishing as a public right, limited entry appears to be an eventual necessity. Because regional differences exist with regard to urgency, acceptability, and detail, NACOA recommends that planning for limiting entry into fisheries be initiated by all regional councils, but that study and public debate precede approval by the Secretary of Commerce for implementation of any specific regional plan.

Membership on Regional Fishery Councils

The eight Regional Fishery Management Councils vary in size from seven voting members for the Caribbean to 19 for the Mid-Atlantic Region. The Secretary of Commerce appoints approximately two-thirds of these from lists supplied by the Governors of the States. The remainder are State and Federal officials designated by title in the Act. NACOA believes the public members appointed by the Secretary should represent a balanced mix of interests broader than is now required by the statutory requirement that they be knowledgeable about some aspect of the regional fisheries. For example, because decisions may ultimately affect the cost of food from the sea, there should be consumer representation on each council.

Council members should continue to be selected for their practical knowledge of marine fisheries, but should also have a breadth of viewpoint from which to assess fairly the views and needs of diverse interests. NACOA believes that council members can be selected from groups directly affected by council action, but only if the individuals concerned have exhibited the breadth of vision that will enable them to make decisions independent of their own interests and beneficial to the public. NACOA does not criticize the present membership of the councils, but offers these suggestions as a policy for selecting new members as the statutory rotation provision takes effect. NACOA recommends that guidelines for this purpose be developed by the Secretary of Commerce in consultation with the State Governors.

The National Marine Fisheries Service of NOAA, the Bureau of Oceans and International Environmental and Scientific Affairs of the Department of State, and the Coast Guard of the Department of Transportation have done an excellent job of implementing the new fisheries law so far. Acceptance by foreign governments of the Governing International Fishery Agreements required by the law, completion of preliminary fishery management plans by March 1, 1977 (the date of effective law enforcement by the United States), and the outstanding success of the first few months of enforcement of the new regulations imposed upon foreign fishermen are most encouraging.

However, there is room for improved cooperation among the Commerce Department, the State Department, the States, and the Regional Fishery Management Councils. It was evident to fishery advisors during recent negotiations on the Governing International Fishery Agreements under the new law that there had been inadequate consultation between the Department of State and the Departments of Commerce and Transportation, and with the regional councils involved.

There is also considerable uncertainty between the Commerce Department and the regional councils, and between the councils and the States with respect to some aspects of jurisdiction under the Fishery Conservation and Management Act. For example, as between the Commerce Department and the regional councils, who shall determine what research is needed and who shall conduct the research? As between the councils and the States, who has jurisdiction over a resource that exists both inside and outside the territorial jurisdiction of the State? If a State has jurisdiction over a resource harvested only within its jurisdiction but the resource also exists beyond 3 miles from shore, does the State have the right to impose restrictions on the resource outside its borders? These and other questions need clarification.

The Tuna-Porpoise Problem and Marine Mammal Management

The as yet little understood association of yellowfin tuna and porpoise schools allows porpoise to be used as the surface indicators of underlying commercially valuable tuna stock. Unfortunately, one of the techniques now used for harvesting these tuna (by purse seine nets) results in killing some of the accompanying porpoises, in spite of recent developments by U.S. fishermen in net design and operational procedures aimed at reducing the hazard. Porpoise mortality, estimated to be down to about 100,000 in 1976 from near 300,000 in 1971 and 1972 when the protective methods now in use were first introduced, can be further reduced but probably not completely eliminated without halting an effective fishing technique that accounted for 39 percent of the U.S. tuna catch in 1975.* A court order, based on the Marine Mammal Protection Act of 1972, to reduce to zero the mortality of the Eastern spinner porpoise judged to be in a depleted state, temporarily stopped

---

* "Progress of Research on Porpoise Mortality Incidental to Tuna Purse-Seine Fishing for Fiscal Year 1976." Southwest Fisheries Center Administrative Report No. LJ-76-17, National Marine Fisheries Service, NOAA, September 7, 1976, page 106.

the industry this year. This, in turn, led to Congressional efforts,* still in progress, to amend the Marine Mammal Protection Act for at least a temporary relaxation of the ban on spinner porpoise kills in favor of a modest quota calculated as certain to permit population increase. The proposed amendment (H.R. 6970) also raises quotas established by the National Marine Fisheries Service for other affected species of porpoise.

The Marine Mammal Protection Act of 1972 requires "that the incidental kill or incidental serious injury of marine mammals permitted in the course of commercial fishing operations be reduced to insignificant levels approaching a zero mortality and serious injury rate." NACOA believes that such a restriction is unrealistic and places an unnecessarily severe burden on commercial fishing. NACOA agrees with H.R. 6970 that complete protection of a species is often *not* required for its assured survival and may even at times result in less than optimum conditions for its members.

NACOA also agrees with H.R. 6970 that it is highly important to make a strong effort to persuade foreign countries to adopt the same restrictions as the United States. It seems self-defeating for U.S. tuna fishermen to suffer economically by being restricted, only to see the porpoise populations threatened by the unrestricted activities of foreign fishermen who, at the same time, gain a competitive advantage.

The Marine Mammal Protection Act has a number of deficiencies and ambiguities that need correction. Among the matters that need clarification or elaboration for improved regulation are:

- options other than a moratorium on all activities likely to result in marine mammal deaths in cases where other nationally significant ocean uses come in serious conflict with the objective of immediate stock recovery and where it is determined that stock recovery can be assured over a reasonable period of time without zero kill;
- correcting the current deficiency in data on porpoise population and reproductive characteristics necessary for effective stock management;
- assuring that the U.S. tuna industry is not placed at a competitive disadvantage with foreign fisheries;

---

* H.R. 6970, introduced in the House of Representatives on May 20, 1977, by Representative Murphy of New York, Chairman of the Committee on Merchant Marine and Fisheries, passed the House in June and is still (as of June 30) under consideration in the Senate.

- assuring that the reduction of U.S.-caused porpoise mortality will not be offset by increased foreign-caused mortality to the ultimate detriment of the world stock; and
- developing a marine mammal protection policy in general, not merely for porpoise, that balances the various interests in ocean use and resource development.

Law of the Sea and International Cooperation in Marine Affairs

Towards a Law of the Sea Treaty

In its First Annual Report, dated June 30, 1972, NACOA expressed misgivings about the likelihood of agreement resulting from the United Nations Conference on Law of the Sea (UNCLOS), then about to convene.* NACOA recognized that, while waiting for a satisfactory treaty, economic and other pressures could mount to the point where individual nations, including the United States, would find it necessary to take unilateral action. NACOA urged the United States to prepare interim arrangements that would protect U.S. interests but which could mesh with the international agreements expected from the Conference.

NACOA repeated this recommendation in 1974 and, with regard to coastal fisheries, then the most urgent issue, advocated unilateral action if UNCLOS failed to reach agreement by the end of the 1975 session. NACOA strongly supported passage of the Fishery Conservation and Management Act of 1976 to accomplish this purpose, and in retrospect feels that this Act is a good example of how the nature and timing of unilateral action can serve a vital domestic need while showing due regard for the international community. It undertook to preserve a

* The First United Nations Conference on Law of the Sea was held in Geneva in 1958. Eighty-six nations participated. A Second Conference was held in 1960 and was attended by representatives of 89 nations. The Third United Nations Conference on Law of the Sea, to which we refer, held its first session in December 1973. The sixth session of that Conference is in progress in New York at the time of this writing, with 155 nations participating.

threatened marine resource of great value to the United States and to encourage rehabilitation of our coastal fisheries while making allowance for international dependence on it in a fashion that is widely recognized, if only tacitly, as both reasonable and just.

Although the United States approached the 1977 sessions of the Conference with new vigor, NACOA judges that several U.S. interests will be in jeopardy if we have to wait very long for a comprehensive and ratified UNCLOS treaty.

The issue of control over deep seabed mining beyond the range of national jurisdition appears at this point to be the major issue of contention. The developed maritime nations such as the United States insist on the right to use the manganese nodules of the deep seabed with only general supervision by an International Seabed Authority to which they would pay royalties out of profits. On the other hand, the developing nations, the "Group of 77," insist that all deep sea mining should be under the strict control of the proposed Seabed Authority, including licensing, production, and even pricing of deep seabed minerals.

Attempts have been made since the last formal meeting of UNCLOS in August of 1976 to resolve this issue. A preliminary meeting was held in Geneva early in 1977 and reports indicate that some progress was made, at least in attitude, although no agreement was reached.

UNCLOS convened again in late May of 1977, but as of this writing, it seems unlikely that agreement on a regime for the control of deep seabed mining will be reached at this meeting.

Whether or not substantial progress is made, NACOA urges the President and the Congress to support domestic deep seabed mining legislation that would make it economically feasible for interested companies to proceed with development and production. We agree with the recent testimony of the Secretary of Commerce before the House Oceanography Subcommittee of the Merchant Marine and Fisheries Committee.* She noted that "the Law of the Sea treaty would provide for some form of revenue-sharing with the international community. Unless we have a commercially-successful seabed mining industry, there would be no revenues to share. Therefore, it is in the interest of the United States and the entire world that the industry proceed with com-

* Testimony of the Honorable Juanita Kreps, Secretary of Commerce, before the U.S. House of Representatives Committee on Merchant Marine and Fisheries, Subcommittee on Oceanography, May 11, 1977, on H.R. 3350, the Deep Seabed Hard Minerals Act.

mercial recovery as soon as it is technically, environmentally, and economically feasible."

We believe it is technically and environmentally feasible now. Legislation is needed, however, to make it economically feasible. In our view this does not require guarantees against financial loss from all causes. It does require "assurance that a legal regime laying the foundation for a stable investment climate will exist during the lifetime of commercial operations," to quote further from the same testimony. This could be provided either by financial guarantees or by assuring "grandfather rights" to operations predating the passage of a treaty.

We endorse the Administration's position, stated in the Secretary's testimony referred to above, "that any seabed mining legislation would have as a minimum the following characteristics: it should be interim in nature, clearly indicating that it is our intent that it be superseded by a Law of the Sea treaty; it should reaffirm the legal position of the United States that seabed mining is a freedom of the high seas, subject to the duty that it be carried out reasonably, with due regard to other ocean users; it should provide for sound environmental assessment and management; it should provide duty-free entry of seabed minerals mined under permits granted by the United States; and it should encourage harmonization of other nations' seabed mining legislation."

Finally, we recommend that the legislation make it clear that claims to jurisdiction over, or property rights to, portions of the seabed itself are not being sought and that permits apply only to recovery of the resource being mined.

Another issue of particular importance to the United States relates to the conduct of scientific research in the economic resource zones of coastal nations. The current Revised Single Negotiating Text* requires coastal nation consent for all research within the economic zone together with a set of obligations to be met by the researching State. If at any time a coastal nation feels that these obligations have not been met, it has the authority to block any project of any operator from the researching nation. One article requires that the results of a research project considered to "bear substantially" on exploration or exploitation of the living and nonliving resources of the economic zone or on the continental shelf shall not be published against the express wish of the coastal nation.

---

* The Revised Single Negotiating Text, dated May 10, 1976, was issued by the President of the Third United Nations Conference on Law of the Sea as a procedural device to assist negotiations at the Conference.

Because important scientific and practical problems are concentrated in coastal and offshore regions, much of U.S. ocean research takes place in economic zones throughout the world. Accordingly, U.S. scientists seek textual revisions that would limit coastal nation controls, clarify obscure language, and increase predictability of coastal nation action.

NACOA recommends that the U.S. delegation to UNCLOS press hard for major changes in the Revised Single Negotiating Text so that marine scientific research can continue in the economic zones of coastal countries under reasonable conditions of cooperation and sharing of the benefits of such research.

Other issues remain to be solved at the Conference. The nature of the 200-mile economic resource zone outside of the 12-mile territorial limits of coastal nations remains to be determined. Once again, the differences are between the developing nations on one hand and the developed nations on the other. The developing world sees the economic resource zone much like a territorial sea with control of certain functions by international agreement. On the other hand, the developed maritime nations see this economic resource zone as part of the high seas except specifically regarding control of resources by the coastal nations. In the meantime, the chairman of UNCLOS has attempted to find a middle ground which would put this zone into a category of jurisdiction which is neither that of a territorial sea nor the high seas but unique in itself.

Another unresolved issue is whether coastal nation jurisdiction extends to the outer edge of the continental margin where this is beyond 200 miles. There is some opposition to the extension of coastal nation jurisdiction this far, but most observers expect that the coastal nations will end up controlling the entire continental margin with perhaps some obligation for revenue sharing.

On the other hand, UNCLOS has, as is reflected in the Revised Single Negotiating Text before the Conference, achieved a general consensus on the 12-mile territorial sea, unimpeded transit through straits, a 200-mile economic resource zone, and general provisions to prevent pollution from vessels.

Other Means for International Cooperation

Still there remains the possibility that no general Law of the Sea treaty will come into effect because of the difficulty in finding a formula for a deep seabed regime or for some other reason. In addition to taking judicious and considered unilateral action, the United States should make full use of the bi- and multilateral agreements and special international bodies to oversee them that already exist in many areas requiring international cooperation. Such agreements and organizations

usually deal with selected aspects of ocean affairs. They may be intergovernmental or nongovernmental, and they may involve few or many countries on a regional or global basis. The United States participates in 15 U.N. agencies involved in ocean affairs, another 13 fishery management commissions, eight other intergovernmental organizations, and some six nongovernmental bodies.

In general, relations with intergovernmental bodies are the responsibility of the State Department. When that Department is not expert in matters of substance, responsibilities may be extensively delegated to pertinent agencies. For example, NOAA is responsible for U.S. participation in the World Meteorological Organization, the U.S. Coast Guard for the Intergovernmental Maritime Consultative Organization, and NOAA and Navy for the International Hydrographic Organization. In other cases (for example, the Intergovernmental Oceanographic Commission and the International Council for the Exploration of the Sea), the State Department through an interagency committee establishes a collective view on matters of substance that is then presented by the U.S. delegation. Nongovernmental consultants and organizations (e.g., the Ocean Science Board and the Ocean Policy Committee of the National Academy of Sciences) are used to involve the scientific community in developing these positions. Where domestic jurisdiction for a given program is unclear (e.g., where NOAA and EPA share responsibility for controlling marine pollution), the U.S. position may differ from one international body to another.

Because of the breadth and complexity of U.S. interests in ocean affairs, it seems inevitable that we continue to deal with a large number of international organizations. Rather than trying to simplify the international apparatus at this time, we should concentrate on achieving U.S. goals and objectives through present international organizations, but remain alert to opportunities for improving the mechanisms.

The effectiveness of many intergovernmental organizations has been weakened during recent years by the injection of political issues external to their basic purposes. Although this politicization arises from the same complex issues involved in the LOS negotiations, it is unlikely to disappear even when those negotiations have been completed. The United States has in some cases been a party to this process when it seemed necessary to protect national interests. Yet if these organizations are to operate effectively, it is essential that they concentrate on their special responsibilities. Therefore, we urge the Department of State to exert strong U.S. leadership in an effort to minimize political considerations. This will require a thorough reassessment of the extent to which our purposes in fact coincide with the formally stated purposes of each of these organizations. Where this coincidence is present,

the Department of State and U.S. representatives should reassert this fact and press for proceedings that meet the test of being germane to this purpose. This will not be easy in many cases, but in our opinion the specialized agencies are intrinsically too important to permit continued obfuscation by political issues.

Ocean Engineering

The sea is intolerant of man's engineering weaknesses and oversights. It is a dynamic and difficult operating environment leaving little room for technical uncertainty. The weather and the biological, physical, and chemical processes occuring within the oceans severely test structures, systems, and man himself.

The Nation is coming to realize that opportunity for enterprise doesn't stop at the shoreline, and that we must be as capable of operating in ocean areas as we are on land. We must be able to monitor and operate within the full three-dimensional sea space for both civil and defense needs; extract resources, both living and nonliving; build structures safely within the ocean environment; perform research and conduct surveys on and under the sea; and decide where offshore facilities can be safely sited.

Federal ocean engineering expertise is distributed widely but unevenly among the executive agencies charged with marine responsibilities. The Navy clearly has by far the most advanced capability within the Federal establishment. It is the largest and most active Federal ocean-related activity pursuing engineering technology development. Its manpower and capital investment are significant, as they must be in view of the Navy's broad mission. To a lesser degree, ocean engineering capabilities reside within a number of other Federal agencies to support their in-house program needs. A major and sophisticated capability in ocean engineering is also found in various industries engaged in activities such as oil drilling, pollution cleanup, construction of ocean structures, naval architecture, ocean mining, diving, submersibles utilization, and port development.

The United States leads the world in some areas of technology such as oil recovery and deep submergence capability. But technical prominence can be short-lived. If we are to keep our advantage, the U.S.

civil program should be vigorously pressing ahead with ocean technology development on a broad front. We dare not become dependent on the capabilities developed by other nations.

Some activities during the next decade that will require a stronger technical capability and a broader data base than we now have are effective and safe offshore fossil energy and mineral development, installation siting, port development, material testing, instrumentation, hardware, fishery technology, and thermal and dynamic ocean energy extractive systems. We need to strengthen our ocean engineering capability to support these activities.

There are some encouraging signs. We find increased technical interchange and a growing cooperation (both formal and informal) between groups in the Department of Defense and the civil sector. We are encouraged by the growing use of shared test facilities. We are further encouraged by NOAA's recent creation of an Office of Ocean Engineering with duties that include attention to national ocean engineering concerns.

These encouraging signs, however, should not lead us to believe that we now have an adequate national effort in techniques, materials, and developmental programs addressing problems peculiar to engineering in the ocean environment. The 1974 NACOA report "Engineering in the Ocean"* called for a focal point for our civil endeavors, and for an organization to serve as a catalyst in stimulating engineering R&D and advanced technology, focusing on gaps and deficiencies, fostering technical interchange, ensuring the common availability of data, enhancing interagency programs and effective use of facilities, and maintaining a continuing and mutually purposeful liaison with industry and the academic community.

NACOA believes that the Department of Commerce, with its present responsibilities in marine resources, ocean mapping, marine environmental assessment, and marine data archiving, comes closer than any other Department to being a logical Federal focus for civil marine matters to provide the needed ocean engineering leadership for the Federal and private sectors, as does DOD in defense matters. It may be that a properly mandated, structured, and funded Office of Ocean Engineering within NOAA can evolve into this role even though it is also assigned responsibility for support of NOAA's own engineering needs.

In support of a more coherent and more encompassing program, NACOA recommends that the Secretary of Commerce foster and selec-

* "Engineering in the Ocean." A report for the Secretary of Commerce by the National Advisory Committee on Oceans and Atmosphere, November 15, 1974, 54 pages.

tively support programs within industry, the universities, and the Federal agencies, to:

- identify and correct deficiencies in civil ocean engineering and technology;
- assure the availability of technical data needed by the ocean engineering community;
- develop technical ocean engineering criteria and material assessments and standards for use by industry and the Federal Government; and
- encourage the cross-utilization of military and civil engineering laboratories and test facilities.

There ought to be a continuing close relationship between these civil ocean engineering efforts and the DOD engineering programs. The Navy, as mentioned earlier, has broad competence in ocean technology development. It possesses advanced technical and operational capabilities that would help our national civil ocean engineering effort. In addition, the Navy maintains a range of engineering and test facilities that should be applied to national tasks. Since this would be a significant departure from the Navy's primary defense mission, the Navy should be specifically authorized to undertake this task, either by Presidential directive or by legislation.

We believe that closer and more formal organizational ties between the various Federal participants will be required in the future and our present recommendations should not preclude this possibility. However, the need for strengthening the civil U.S. ocean engineering effort is immediate and our recommendation is aimed at accomplishing this promptly and with minimum disruption of present organizations.

Since the program is an interagency effort, we believe it desirable to provide an overview from a broader perspective than can be found within any particular agency. NACOA therefore recommends that the Office of Science and Technology Policy provide a comprehensive and continuing review of our Federal ocean engineering and undersea technology efforts. This review should:

- evaluate the ocean engineering and technology capabilities of the U.S. public and private sectors, and determine how they compare with those of other nations;
- identify significant technological problems in both defense and civil applications, recommend areas for improvement, and determine whether a proper focus and adequate funding are being provided; and
- result in a periodic report to the President on the status of ocean engineering and technology in the Nation.

Ocean Research and the Academic Fleet

In its Second, Third, and Fourth Annual Reports, NACOA expressed its concern that the federally-funded academic fleet was rapidly becoming obsolete, and that no plans existed for its upgrading and replacement. NACOA recommended that the National Science Foundation (NSF) and the Navy take steps to remedy this situation.

Yet it appears that there are still no federally approved long-range plans for maintaining, upgrading, and eventually replacing elements of the academic research fleet. The only funds for maintenance and upgrading are provided by NSF on a year-by-year basis, and there are no continuing provisions in the budgets of any agency for design and construction of replacement or additional vessels.

The discussion that follows relates only to the federally-funded academic research fleet.* Other components of the national ocean research fleet include vessels of Federal agencies, principally NOAA and the U.S. Naval Oceanographic Office, and a number of smaller university research vessels used principally on local operations. Because so much ocean research in this country is conducted on the major academic research ships, we have selected them for emphasis.

---

* This fleet consists of 28 ships plus the research submersible ALVIN. The vessels are operated by 15 different institutions. Twenty of the ships were constructed with Federal funds and 14 are still owned by the Federal Government (10 by the Navy, four by the National Science Foundation). The ships range in size from 65 ft. to 245 ft., with 12 smaller than 120 ft., two between 120 and 170 ft., and 14 in the range 170 ft. to 245 ft.

Importance of Maintaining the Academic Research Fleet

In most countries of the world, the bulk of marine research is conducted by government laboratories using research vessels operated by the government. The United States is unique in the extent to which oceanographic research is a function of non-Federal laboratories which operate their own research vessels. Thus the health of the U.S. academic research fleet is vital to the success of a national oceanographic program.

Prior to World War II, there were few academic research laboratories and only a handful of research vessels. These vessels were relatively small and operated mostly in coastal waters. After the war, the number of oceanographic institutions and research vessels increased rapidly. Growth of the academic fleet was strongly supported by the Navy, and later by NSF, through conversion of vessels, most of which were formerly used for military purposes.

By 1977, nearly all of these converted vessels had been replaced with ships designed and constructed specifically for research. Of the 28 ships which constitute the present academic fleet, only five were constructed before 1961, and five have come into service since 1973.

Use of these vessels is coordinated through the University-National Oceanographic Laboratory System (UNOLS), set up by the academic community to coordinate operations and planning for the academic fleet. Most of the operating expenses are provided by the National Science Foundation's Office of Oceanographic Facilities and Support. Estimates indicate that during FY 1977, total fleet operating costs will be $22.3 million. Of this, $15 million will come from NSF, $3 million from the Office of Naval Research, less than $1 million from the Energy Research and Development Administration, and the remainder from other Federal agencies, States, and other sources. In the last few years, there has been heavy use of academic ships by the Bureau of Land Management and other mission-oriented Federal agencies and their contractors.

There are several needs that must be met if the academic fleet is to continue to serve national objectives. These include:

1. the need to keep the material condition and the navigational and scientific capability of the ships up to date,
2. the need to match the capability of the fleet to the scientific programs of its users, and
3. the need to plan and fund replacement or additional vessels in a systematic and timely fashion.

Material Condition and Operating Capability

As the research fleet ages, there is an increasing need for substantial investment to maintain material condition. This includes replacement and upgrading of auxiliary electrical systems, major power and propulsion units, heavy deck machinery, and habitability. From time to time, modifications must be made because of failures or accidents, or because they are required by changing government regulations. Examples of the latter are reballasting, installation of waste-handling systems, and installation of new communications systems.

In the case of the five major vessels that are now between 12 and 15 years old, major refits are projected to require an investment of about $5–6 million over the next 5 years. Comparable upgrading of smaller ships will require additional expenditures.

The scientific capability of the fleet also requires continual upgrading as the state-of-the-art advances. Major items of scientific equipment are increasingly expensive. For example, a giant piston corer together with an integrated winch, wire, and core handling system is estimated to cost $500,000 to develop, with subsequent facility costs of $100,000 per year. Other major items include multichannel seismic systems, computers, and data acquisition systems. When such items are required for research programs but are not available, research vessels become obsolete.

In FY 1977, NSF provided approximately $1.07 million for ship improvements, including $0.41 million for basic ship modifications, $0.40 million for science-related modifications and equipment, and $0.26 million for data collection, processing, and analysis. This funding level represents less than half of what was needed.

Match of Fleet and Program

Next to maintaining the fleet's condition and operational capability, the most urgent problem is to match the structure (i.e., size, design, and distribution) of the fleet to the scientific programs contemplated by its users. The present fleet developed over several decades in an *ad hoc* fashion to meet the program needs of various scientific institutions. Because of the long lead time from conception to delivery of a research vessel, the makeup of the fleet reflects the attitudes and forecasts of 10 to 20 years ago. The vessels that came on line in the early 1960's were conceived and designed in the 1950's.

Changes have occurred during the last decade that are already having an influence on the research fleet required for the 1980's:

1. Recent developments in Law of the Sea negotiations suggest that research in areas of the ocean falling under the jurisdiction of other countries will be increasingly restricted.

2. The price and availability of fuel have become significant factors in the cost of operation.
3. Recognition of the energy problem is accelerating exploration and development of offshore resources of oil and gas.
4. Greater attention is being given to the effects of pollution from land- and ship-based sources and from offshore mining and petroleum operations.
5. Federal funds for mission-oriented research, largely within a few hundred miles of the U.S. coast, have grown much more rapidly than those for more basic research on the high seas and in distant waters.

These changes have already caused an occasional surplus of available time on the larger research vessels and an increasing demand for the smaller vessels better suited for research in coastal areas. UNOLS and NSF have recognized this and have commissioned several design studies for coastal vessels, but funds for their construction have not yet been budgeted. There is a demand for other specialized vessels, such as one for research in polar waters, also unfunded. The existing fleet, designed for functions conceived a decade or more ago, is inefficient for the newer needs.

Although the marine scientific programs of the 1980's and beyond are not yet known, some progress is being made in their formulation. As the above discussion suggests, there may be greater emphasis placed on research within the U.S. 200-mile economic resource zone. An intensive effort is underway to plan a successor to the International Decade of Ocean Exploration. Disciplinary and interdisciplinary workshops are considering both desirable research within the U.S. coastal belt and studies on the high seas and in distant waters. By the end of 1977, a prospectus for scientific work in the next decades should be available for use in planning the fleet required to carry it out.

The Need for a Replacement Plan

Replacing or adding to the academic research fleet will require substantial investments. For example, replacement of the five vessels constructed before 1961 would cost at least $15 million. Recent NSF/UNOLS design studies show that a polar research vessel would cost more than $13 million. New coastal research vessels would cost $1.25 to $2.5 million each, depending on size. Not only is the cost substantial, but the lead time is long. A new ship needed in 1981 should have design funds in the budget now.

As discussed above, the structure of the fleet should be matched to the current and anticipated programs of its users. In the near term it may be desirable to concentrate new construction on vessels more suitable for use in waters within 200 miles of the U.S. coast. Wise investment in an academic research fleet adequate to the tasks ahead will require identifying the research vessels required to carry out scientific programs anticipated over the next few decades. UNOLS has already made a start on analyzing the research vessel requirements for scientific programs contemplated by its members for the 1980's and into the 1990's. The report on this analysis should include recommendations for upgrading the present academic fleet and specify the types, numbers, and timing of additional and replacement vessels required to carry out future programs.

The Federal Coordinating Council for Science, Engineering, and Technology (FCCSET) in consultation with UNOLS, should develop a national plan for maintaining an effective academic research fleet. FCCSET should recommend the financial investment and schedule required for implementing this plan and the National Science Foundation should be designated lead agency for implementation.

Administering the Academic Research Fleet

Among the proposals being discussed for reorganizing the administration of ocean affairs in the Federal Government is assignment of the academic research fleet to a reconstituted NOAA. Centralized management of the fleet was considered several years ago and led to establishment of UNOLS, an organization designed to improve coordination and planning in the use of academic oceanographic facilities. Under the UNOLS arrangement, vessels are operated by academic institutions and their use is shared with other institutions having federally-funded research programs. Management by the institutions concerned has been cost-effective, with vessel utilization rates higher and costs lower than those of comparable vessels operated by Federal agencies. We believe that operation of the federally-funded academic research vessels should be left in the hands of the academic institutions, with their utilization coordinated by UNOLS.

Educating the Public in Marine Affairs

The successful implementation of a national ocean policy will be greatly helped if the public understands the Nation's stake in the oceans. Such understanding and public awareness should begin at the elementary school level and continue through college and beyond. Radio, television, newspapers, public lectures, and museum programs can be used to supplement more formal educational practices and to disseminate learning material and general information to the public.

It is generally agreed that the basic skills—reading, writing, and arithmetic—are the essential elements in elementary and even in secondary school curricula. Other subjects are added to or interwoven with these basics as society gains new perceptions and as its values and priorities change. This can be seen in the recent emphasis in elementary and secondary schools on relatively new subjects such as the environment, space, energy, and consumer skills.

The growing importance of the oceans and the coastal regions has led educators in many places to look for suitable marine-related information and materials. Growing enthusiasm among the students themselves for studies and information about the marine environment is a further stimulus. A National Marine Education Association has been formed and the publication of a Journal of Marine Education has begun, providing a nationwide forum for the interchange of marine-related curriculum materials and ideas originating at the local level. NACOA believes that there is a worthwhile role that can and should be played by the Federal Government in support of these local efforts.

A Role for the Federal Government in Marine Education

While it is clear that the Nation's educational system is controlled primarily at State and local levels, the Federal Government does play an important role. There is a large body of Federal education legislation which defines this role, the most recent being the Education Amendments of 1976, Public Law 94–482. The Office of Education in the Department of Health, Education, and Welfare is the primary Federal agency responsible for administering programs of financial assistance to State and local educational agencies, institutions and organizations. The National Science Foundation is charged, in addition to its other functions, with strengthening science education programs at all levels. The National Sea Grant Program in the National Oceanic and Atmospheric Administration (NOAA), established in 1966, is another vehicle for government support of education, research, and advisory services relating to the development of marine and coastal resources. While Sea Grant has not in the past been extensively involved in pre-college marine education, the Director of the National Sea Grant Program wrote to the Directors of the University Sea Grant programs in February 1977, that "the expertise and infrastructure of the Sea Grant system can and should contribute to improving the marine content of pre-college education through cooperation with and support of local, regional, State and national organizations and agencies that foster and are responsible for pre-college education."

The Office of Coastal Zone Management in NOAA has also provided support to local and State school officials for increasing awareness of the importance of the oceans and the coastal zones. In addition, planning is underway for a series of six to eight regional conferences, sponsored by the White House, each devoted to a particular national coastal issue in need of attention.

NACOA strongly endorses these efforts and recommends that NOAA and the National Science Foundation cooperate with the Office of Education in assisting State and local education agencies to develop and incorporate marine materials into the elementary and secondary curricula. Federal assistance is especially needed in:

- fostering a national dialogue on marine education designed to encourage State and local educational agencies to determine and adopt the approach to marine education best suited to the particular needs of the children they serve;
- promoting the development of curriculum materials for use in integrating marine concepts and knowledge into the teaching of the basic skills;

- supporting demonstrations and evaluations of current marine education programs and practices in order to help disseminate effective approaches; and
- providing funds for the training of teachers and other personnel in the use of marine education materials.

The Role of the Mass Communications Media

Newspapers, magazines, radio and television are able to reach segments of the population that the formal educational process often cannot. NACOA urges increased use of the mass media for raising the level of marine and coastal awareness in the general public.

The "National Foundation on the Arts and the Humanities Act of 1965," Public Law 89–109, established a National Endowment for the Humanities, which among its other functions is intended to foster education in, and public understanding and appreciation of, the humanities. It has taken the lead in the use of newspapers for increasing public understanding in many areas, including marine affairs, by funding a series of "Courses-by-Newspaper." The articles are published in consecutive weeks by newspapers across the country without further editing to maintain uniformity throughout the Nation. In addition to this scatter-shot approach, seminars based on the courses are offered at various colleges and universities, sometimes for credit.

Course V of the series, "Oceans, Our Continuing Frontier," was developed under the leadership of the University of California at San Diego. The course consists of 16 major sections prepared by experts in the respective fields which examine a wide range of marine subjects and the importance of the oceans to mankind as a place for work and play, a source of valuable resources and a mainstay of national strength.

The Oceans Course has had wide appeal and has been effective in stimulating interest in the oceans and in marine affairs. Thousands of newspaper readers have earned college credits, while many thousands of others, by reading the weekly course articles in their local newspaper, have broadened their horizons in ocean matters.

NACOA believes the series would be even more effective if supplementary audiovisual material is developed and made available to television stations, schools, and libraries.

NACOA recommends that the Office of Education explore with the National Endowment for the Humanities possibilities for the development of audiovisual aids to accompany the Oceans Course, at least on a trial basis.

EPA Management of the Nation's Air Pollution Monitoring Programs

Air pollution monitoring provides information about the distribution and concentration of pollutants that have been identified as potentially hazardous to health or to the environment. Large amounts of monitoring data are being accumulated throughout the country. In many cases, these data are collected to meet specific State and local regulatory and enforcement requirements. Such data are often not suitable for comparison with data collected elsewhere. This makes it difficult to draw from existing programs the information needed to assess nationwide trends and patterns, and to serve a variety of research purposes.

The Environmental Protection Agency (EPA), which is directly or indirectly responsible for much of the Nation's air pollution monitoring activities, is aware of the problem and has taken some steps to improve matters. But EPA has had difficulty marshalling the necessary resources, and the improvement of monitoring appears to have a lower priority within the agency than we believe is justified.

This situation has two causes. First, Federal legislation assigns primary responsibility for monitoring to support regulatory and enforcement activities directly to the States, with the EPA role confined to establishment of guidelines, provision of technical and financial assistance, and approval of State plans. Second, EPA responsibilities themselves are decentralized. The Administrator of EPA in 1972 delegated the agency's monitoring responsibilities to a number of its program offices and its 10 regional offices. Accordingly, funds and personnel to support various monitoring programs are sought directly by EPA's

Office of Research and Development, by its Office of Air and Waste Management and by EPA's 10 regional offices, in competition with other pressing regulatory and enforcement programs.

Although monitoring is properly viewed as a multifaceted activity whose character differs according to whether it supports regulation, enforcement, or research as well as according to region, from a systems management point of view monitoring should also be viewed as the base from which assessments are made on various scales, including the national scale, of what is happening and what needs to be done. NACOA believes that effective air pollution control requires a sounder base of high quality information than is now available on the concentration and distribution of pollutants across the Nation. This, in turn, requires an effective focus of responsibility for quality control of monitoring activities throughout EPA. To the extent that such a focus now exists, it is found in the Office of Research and Development. However, this Office is severely resource-limited, and lacks the necessary authority to implement its monitoring guidelines on an agencywide basis.

Statutory Roots

The Clean Air Act (P.L. 88–206, as amended) assumes that for each hazardous pollutant there is a concentration below which there is no need to attempt further reduction. The Act sets forth a strategy of air pollution control having three major elements:

1. The Environmental Protection Agency identifies harmful pollutants and determines levels of concentration for such pollutants which may not be exceeded. This is done on the basis of research and after holding public hearings.
2. Each State develops an implementation plan, following EPA guidelines, to assure that air quality associated with these levels is achieved. The plans include provisions for monitoring and surveillance, regulation, enforcement, and control and abatement measures, and must be approved by EPA. If any State does not properly develop or carry out its plan, EPA has the authority to step in and develop and enforce its own regulatory measures within that State.
3. EPA provides matching grants to the States for developing, maintaining, and improving their implementation plans. In addition, EPA provides funds and technical support for a host of related activities, such as research, training, data collection, and development of control technology.

The emphasis in State and local pollution monitoring is on determination of the sources, types, and amounts of various air contaminants within an air shed or Air Quality Control Region. Although State implementation plans must receive EPA approval, there is little or no central coordination of monitoring programs to ensure that the data collected will be useful for purposes other than those for which the individual monitoring networks were designed.

The Multiple Purposes of Air Pollution Monitoring

Air pollution monitoring is needed for a variety of purposes. It provides the basis for declaring pollution alerts and taking emergency action such as implementing temporary control and abatement procedures. It provides indications of trends in air quality within a given locality and thus indicates the effectiveness of control measures, and also of differences from one air shed to another. It can provide data on the distribution and concentration of atmospheric impurities that have not yet been identified as significant or hazardous. On a local scale, it may pinpoint breakdowns in control technology resulting in excessive amounts of pollutants coming from a particular source. Monitoring can provide a data bank to serve as a basis for research, especially epidemiological research relating pollutant levels to health and other impacts. It thus plays an essential role in the promulgation of regulations, in control measures, and in enforcement, as well as in research and in long-term planning.

Monitoring may provide continuous measurements at fixed stations distributed over a large area, including sensors on smokestacks and other sources of emissions, and mobile units operating intermittently as needed. Because different kinds of measurements are needed for different purposes, monitoring has been thought of largely as a support activity inseparable from its immediate purpose. Every State and local agency, and each component of EPA having responsibility for pollution control, assessment, or research, collects what data it needs for its decisions. EPA is a decentralized organization. Setting standards and promulgating regulations are headquarters functions, but financial and technical assistance to the States, and approval and oversight of State implementation plans, are carried out largely by the EPA regional offices. The Office of Research and Development is responsible for developing guidelines for maintaining the quality of the data emanating from the Nation's diverse air pollution monitoring programs. However, nowhere in EPA below the level of the Administrator is responsibility assigned for assuring that these guidelines are implemented and that satisfactory and uniform data quality is achieved.

Auditing and assessing State monitoring programs is a responsibility of EPA's regional offices, with guidance and technical assistance from the Office of Research and Development. Developing operational guidelines, maintaining a data bank, and analyzing trends is a responsibility of the Office of Air and Waste Management. Responsibility is fragmented. It is hardly correct to speak of a single national air pollution monitoring program. Each State operates its own network or networks; localities may also operate their own programs; EPA itself operates some for research purposes; and numerous other governmental agencies, industrial organizations, research institutions, and others maintain monitoring programs serving a variety of purposes.

The data obtained from monitoring are limited in applicability if not of uniform, high quality. This requires that uniform rules and procedures be applied to selection of the equipment and procedures to be used; calibration of instruments; training of the personnel making the measurements; and recording, processing, archiving, and data retrieval. All these steps contribute to what we may term the "intercomparability" of the data. Measurement of a given pollutant in one location must mean—within a known degree of precision and accuracy—the same as it does at another location if the measurements are to be of more than limited use.

The public assumes that this is so, and accepts such measurements at face value. But measuring pollutant concentrations is not a simple task. Concentration levels high enough to signify possible danger to health and the environment can still be low enough to present a challenging measurement problem in atmospheric chemistry. Many older methods still in use for measuring pollutant concentrations are barely capable of making accurate measurements at the low concentrations which are critical.* Moreover, calibrations performed on individual pollutants may not be appropriate for operational use with samples containing mixtures of pollutants. An improved and more extensive quality assurance program is needed to ensure data intercomparability.

What is Needed

Uniform nationwide measurement system specifications, and a means of ensuring that they are adhered to, are needed. However, we do not recommend integration of the Nation's air pollution monitoring programs into a single nationwide network, operated centrally by a single Federal agency, with responsibility to collect and disseminate high

* In 1975, EPA issued a regulation allowing the States to phase out obsolete measurement systems over a 5-year period.

quality pollution data for all purposes. There will always be a need for specialized monitoring programs which make measurements in ways and on scales that may differ from place to place.

A single, federally-run "benchmark" network to assess nationwide trends and to serve as a standard for comparison with other networks is one of the recommendations put forth by EPA's Standing Air Monitoring Work Group (SAMWG), which was established in 1975 to look for ways of improving air pollution monitoring. The SAMWG recommendations will be published for comment in the near future and promulgated as regulations later in the year. They address many of the deficiencies that presently exist in the monitoring system. They do not, however, address the problem of assignment of responsibility and authority for overseeing and auditing all monitoring programs of whatever sort carried out by EPA itself, and by States and other entities as part of implementation plans subject to EPA approval. This responsibility must reside within the Office of the Administrator of EPA if it is to be effectively applied to all components of the agency. It must rest with a sufficiently high-level official who can seek and argue for the funds and personnel needed in competition with the more urgent and pressing demands of what is, after all, basically a regulatory agency.

We recommend creation of an "Office of Measurement Science" within the EPA Administrator's office. This office would combine some of the functions that are now found in the Office of Air and Waste Management and the Office of Research and Development. It would:

- develop and assure compliance with guidelines and criteria for site selection, choice of instruments and procedures, operator competence, calibration, and other quality control procedures, and for incorporating improved procedures as the state-of-the-art permits;
- have the oversight responsibility for ensuring that the monitoring data collected, for whatever specific purpose, as part of the Nation's air quality control effort under EPA guidance, constitute a nationwide data base of known quality and of broad applicability;
- maintain liaison with other Federal agencies having monitoring responsibilities, and particularly with the National Bureau of Standards, which conducts basic work in measurement science and establishes measurement standards for use in calibrating air pollution monitoring equipment.

The National Academy of Sciences Study

Our assessment and recommendation closely parallel those arising from a broader study of EPA's monitoring activities (not confined to air monitoring) recently completed by the National Academy of Sci-

ences.* This study identified three major deficiencies in EPA's management of monitoring: 1) inadequate application of scientific principles to the design, operation, and evaluation of monitoring programs; 2) a nearly exclusive emphasis on monitoring for pollution control, with insufficient attention to longer term purposes such as detection of new environmental problems, assessment of trends and impacts, and research on causes of pollution; and 3) inadequate coordination of monitoring activities and insufficient concern for the contribution of individual monitoring programs to the overall national environmental quality effort.

To remedy these, the Academy report recommends establishment of an Office of Science within EPA headquarters. This office would be the focus of concern, at the headquarters level, with defining monitoring objectives and resolving questions of network design, data management, quality assurance, and cost-effectiveness. It would also assist in developing and evaluating prototype monitoring networks on which to base its proposals and designs for monitoring programs, and evaluate the data processing and information handling systems into which monitoring data are fed.

An Office of Measurement Science

We believe the Academy's recommendations satisfactorily address the issues with which we are concerned, although we would prefer to recommend creation of an "Office of Measurement Science" rather than a broader entity concerned with science *in toto*. While our review has been concerned solely with air pollution monitoring, we believe that this office will be most effective if it is responsible for all environmental quality modeling, as the Academy report urges, rather than for air alone.

This recommendation does not advocate that EPA take on responsibilities now resting with the States. Nor does it involve steps which require new legislation. It does, however, mean that EPA should re-evaluate its delegation of monitoring responsibilities to its various program offices and regions. What is called for is recognition of the essential and all-pervasive role of pollution monitoring. While not an end in itself, monitoring is a basic activity conducted to provide information on which to base decisions and future projections.

---

* "Report of the Study Group on Environmental Monitoring." Analytical Studies for the U.S. Environmental Protection Agency, Volume IV, National Academy of Sciences, 1977.

The office whose creation we recommend should meet the need for a monitoring focus in EPA headquarters with responsibility for oversight and quality assurance. It need not be a line manager for monitoring programs. This responsibility can remain with the EPA regions. But it must have the broad authority to reach into the various EPA divisions and require that the monitoring procedures it establishes be implemented, and it should play a role in the budget-approval process for EPA's various monitoring activities.

The Federal Government bears a substantial portion of the cost of the States' air pollution abatement and control efforts. Of the roughly $160 million per year devoted to this purpose (of which about one-third goes for ambient and source monitoring) some $50 million is provided by EPA. This gives EPA enough of a financial stake to allow it to impose, as a condition for approval of State plans, certain requirements which monitoring data must meet. EPA does this now, but not to the extent that it could and should.

The Office of Measurement Science whose creation we recommend should develop a national plan for environmental monitoring. Such a plan should be based on a survey of the various purposes which monitoring serves, an assessment of the common features and the significant differences between the data needed for these many purposes, and an evaluation of the resources needed—funds, personnel, and technology. The plan should clearly set forth the roles of Federal, State, and local agencies, and of private industry, in all aspects of monitoring, including quality assurance, data archiving and retrieval, and coordination. It should be drawn up in consultation with other Federal agencies having monitoring responsibilities, perhaps through a formal interagency mechanism, so that it represents a Federal view of what is needed in a plan rather than simply an EPA view. It should take account of interconnections between different media—a pollutant may be removed from the air and taken up by water, and, in some instances, should be monitored in both media so that its fate can be determined, even though once it is no longer in the air it may no longer present a health hazard. The plan should also take into account regulatory, legal, and legislative activities for which monitoring data may be useful. It should encompass research on health effects, development of technology for pollution control, anticipation of future pollution problems, global aspects of environmental quality, and international sharing of monitoring data.

Weather Warnings and Forecasts

In this chapter, NACOA suggests remedies for several weaknesses of the Nation's weather forecast and warning system, particularly those affecting the delivery of emergency weather warnings. We also discuss the need for improved monthly and seasonal weather projections to serve a variety of important uses such as agriculture and energy contingency planning. Finally, we point out the need for added personnel within the National Oceanic and Atmospheric Administration to provide a number of Federal agencies with weather services which they request in support of their missions.

EMERGENCY WARNINGS

The preparation and dissemination of forecasts and warnings involve five key elements:

1. adequate three-dimensional observations of current weather;
2. proven techniques for making forecasts from these observations;
3. a system for delivering weather forecasts and warnings to the public and to special users, in language which can be readily understood;
4. a public which understands weather warnings, and public officials prepared to act promptly on receipt of warnings; and
5. a total system–including weather instruments, computers and skilled forecasters, and communication links–adequately manned and funded to permit effective operation, especially in severe weather conditions which tax the system to the utmost.

Major storm systems and hurricanes, which may produce high winds, heavy or extensive precipitation, blizzards, and floods, can usually be tracked for a period of perhaps a few days before reaching full intensity. Although predicting where and when their impacts will be felt and how severe they will be is not easy, the system (including forecasting, warning dissemination, and disaster preparedness and relief activities) generally has time to get ready for their full onslaught. River flooding, which often results from melting snows after a particularly snowy winter, falls into a similar category.

Severe local thunderstorms, tornadoes, and flash floods, on the other hand, arise quickly, are short-lived and are highly localized even when associated with the storm systems or hurricanes just mentioned, so that little time is available to gear up for these disasters. Consequently the warning system must be prepared ahead of time if it is to react promptly. It is the limited ability of the system to do this that concerns us most.

For an emergency warning to be effective, the National Weather Service must first prepare and issue an appropriate warning message, identifying the time and place to be affected and the expected impact of the weather occurrence. An example of such a message is, "Heavy rains this afternoon are expected to result in flash floods between 6 p.m. and 10 p.m. along Highway 99, with water levels of 2 or 3 feet along roads in low-lying areas." The warning must then be delivered promptly to the public and to local disaster authorities in clear and unambiguous language. Finally, the public and local authorities must take appropriate action.

Five years ago NACOA examined the effectiveness with which storm and flood warnings were prepared and delivered during Tropical Storm Agnes, which caused 118 deaths and $3.5 billion in property damage in June 1972.* Put briefly, NACOA found that for the most part the technical preparation and issuance of forecasts and warnings by the National Weather Service were satisfactory, but that considerable improvement was needed in the warning delivery system to make certain that appropriate agencies–agencies which can take action–get the message and understand its implications.

Now, 5 years later, NACOA is concerned that not enough has been done to ensure that local officials and the public get the information on

* "The Agnes Floods: A Post-Audit of the Effectiveness of the Storm and Flood Warning System of the National Oceanic and Atmospheric Administration." A report for the Administrator of NOAA by the National Advisory Committee on Oceans and Atmosphere, November 22, 1972, 55 pages.

time and know what to do when an emergency weather warning is issued. While the public response to a warning is not, of itself, within the jurisdiction of the National Weather Service, the expected response should influence the way in which NWS prepares, words, and disseminates its warnings if they are to be effective.

Weather Observations

The first step leading to issuance of a warning is collection of the observations needed to make a forecast. Weather observations are collected in a variety of ways–at surface stations, including those operating automatically at remote locations; from radar, balloon-borne radiosondes, and airplanes; from ships at sea and unattended buoys; and from satellites. Balloon-borne radiosonde observations which transmit temperature, pressure, humidity, and wind as a function of height are particularly valuable, and while these are available at many locations within the continental United States, radiosonde observations at sea are sparse.

The United States formerly operated a network of ocean weather stations aboard Coast Guard cutters maintaining fixed positions, with Weather Service personnel aboard to take soundings. This program has now been reduced to one ship, which is due to be eliminated later this year. Some upper air stations in other nations bordering the oceans (in Greenland, for example) are being phased out. The primary reason for eliminating these stations is cost. Maintaining an ocean weather station by a Coast Guard cutter occupying a fixed position runs approximately $3 million per year, plus $300,000 per year for installation, maintenance, and operation of weather equipment by NWS personnel. Maintaining an upper air sounding station taking two radiosondes daily runs about $145,000 per year, and even more–perhaps as much as triple that amount–in a remote location.

The U.S. weather ships originally served a number of purposes, including aid to aerial navigation and air-sea rescue. With the introduction of electronic navigation systems such as LORAN, and with the increasing use of long-distance highly reliable jet aircraft, these other missions have disappeared, and it became uneconomical to tie up a major vessel with a sizable crew at a fixed location simply to collect weather data. The weather ships have been replaced, in part, by satellites and by aerial reconnaissance, but these are generally not as satisfactory as a network of radiosondes. No alternative methods have as yet been explored, as, for example, radiosondes launched from buoys or from ships that do not remain on station at fixed positions. We note that the United States has been invited by a European consortium of nations to cooperate in their newly established weather ship system in

the Eastern Atlantic, but is unable to participate as this is written because funds are unavailable.

In addition to the basic observation network of surface and upper air sounding stations, much use is made of radars, satellites, and reconnaissance aircraft. The latter are particularly useful for locating and tracking hurricanes and other large, long-lived storm systems. However, smaller short-lived storms such as tornadoes and severe local thunderstorms present a different problem. These storms are small enough to pass undetected between observing stations, and are sufficiently short-lived to make it impractical to dispatch reconnaissance aircraft for surveillance.

Radar observation of these storms, once they have formed, is a useful tool. But much of our weather radar equipment is old, and the radar network is not as dense as it should be, although attempts to rectify this are now underway. NWS plans to add five new units to the national local radar warning network. It will also replace a number of obsolete local warning radars with more modern equipment, and install others where they do not now exist. Purchase and installation of this equipment will cost about $15 million, and annual operation and maintenance will cost about $1.5 million.

Flash floods can be anticipated to a certain extent on the basis of broad, general weather patterns, but cannot be predicted with any accuracy without detailed information about the distribution of rainfall within a particular locality, as well as accurate streamflow and river depth measurements. Here again, the density of measuring sites is not great enough, and too few of the measuring stations are automated. Manual observations cannot always be obtained, especially in bad weather, on the time scale of 1 or 2 hours needed to forecast flash floods.

NWS is improving and automating its rain gage network, and is cooperating with the Department of the Interior in improving and automating the network of river gages (which are, for the most part, owned and maintained by the U.S. Geological Survey). Approximately $0.9 million annually is currently allocated to flash flood programs. This provides for 29 positions and covers only about 15 percent of the Nation. NWS estimates that about $44 million over a 10-year period will be needed to implement a comprehensive national flash flood program. This includes funds for 160 additional personnel, automated and standard gages, equipment maintenance, and implementation and maintenance of self-help programs. This expanded program will protect over 10,500 flash flood prone communities and recreation areas. After the 10-year implementation period, recurring annual costs will approximate $7 million.

Delivery of Forecasts and Warnings

A forecast is a statement, usually in meteorological jargon, prepared by one of 52 Weather Service Forecast Offices across the Nation, telling local weather service specialists what is expected to happen. For this statement to be of practical use, several additional steps are necessary.

First, the forecast must be translated into terms that can be readily understood, and that take into account the local geography, local conditions, and the various options available to the public and to local authorities. To do this, personnel in the local Weather Service Office* (of which there are approximately 250 across the Nation) must know the potential users of the forecasts, the uses to which they will be put, and the terminology that will provide the clearest guidance to users. Terms such as "advisory," "watch," and "warning," while meaningful to the meteorologists, are in too many cases incorrectly interpreted by the public. There is need for a review of the terms used in forecasts and warnings and the development of more suitable and unambiguous language than is now in use. We suggest use of words and phrases whose meaning is already clear (e.g., "emergency") rather than trying to educate the public in the meaning of technical terms.**

Once the forecast has been translated into appropriate language, it must be delivered to the users. Means differ with the nature of the uses and the urgency of the message. Forecasts and warnings may be transmitted to the news services, the press, and others by teletype, recorded for transmission by telephone, broadcast over radio and television, or communicated via special telephone to civil defense officials, police, and various government agencies. By far the most difficult problem is timely delivery of urgent warnings of tornadoes and flash floods to the public, especially in remote areas or while people are asleep.

A number of dissemination techniques have been developed and are in use. In the tornado belt, sirens may be used to warn of an approaching tornado. Aviators and boaters are generally well aware of the significance of weather, and maintain radio contact for weather information. When sufficient lead time is available, forecasts and warnings may be disseminated in newspapers and on regularly scheduled radio and

---

* Some areas of the Nation are not served by local Weather Service Offices, and for those areas this service is provided by the Forecast Office.

** The terms "watch" and "warning," for example, which to many members of the public mean the same thing, have distinct technical meanings. A "watch" is a forecast issued several hours ahead for a sizable area; a "warning" means that the severe weather event (e.g., tornado or flash flood) has actually begun in a particular locality.

television newscasts and weather programs. NOAA has introduced a VHF-FM radio system, called NOAA Weather Radio, which transmits weather information continually and can activate specially equipped receivers so that they either sound an alarm or, if operated in a muted mode, automatically increase their volume to an audible level. Of the 331 stations planned for the complete system, 130 are already in operation. When the system is completed, which is expected within the next 2 years, 90 percent of the Nation's population will be within listening range of one of these stations—although all of these people will not necessarily be tuned to these stations, or even possess equipment capable of receiving these broadcasts. In addition and in cooperation with the Federal Communications Commission and the Defense Civil Preparedness Agency, NOAA is encouraging broadcasters to participate in a voluntary program called the Emergency Broadcast System, which can be activated by local officials to transmit warnings from all participating broadcast stations which are on the air. This effort is valuable but will not reach people in remote areas or those who are without radio or television, such as campers in remote areas of rugged terrain that are subject to flash floods.

The Federal Government cannot impose a compulsory warning delivery system on the public. It cannot require each person to carry a radio receiver keyed to weather broadcasts. Various ways for the public to receive weather warnings have been developed and are available, but the National Weather Service has devoted too little of its resources to the wording of forecasts and warnings, their dissemination, and the gathering of feedback from users to assess the usefulness of its public services and to design improvements.

We also believe that the FCC's reliance on voluntary cooperation by broadcast licensees to disseminate disaster warnings is insufficient when lives are at stake, and that broadcasters should be required to interrupt ongoing programs promptly with official warnings. We have been informed that the FCC feels it lacks the authority to require this under present law. Furthermore, we are aware that First Amendment questions may be involved. Nevertheless, we believe the problem sufficiently important to recommend that the FCC's authority to issue such regulations be reviewed and, if found lacking, be corrected by Executive order or by legislation.

Our findings and recommendations in this connection are in close agreement with those contained in a recent report by the National Research Council.*

* "Severe Storms: Prediction, Detection, and Warning." National Academy of Sciences, 1977.

A Prepared Public

A clear warning message, delivered in time, may still be ineffective if the recipient does not know what to do when he receives it. Generally, people in communities where hazardous weather is common are prepared to act when warnings are received. For example, throughout the Midwest, where tornadoes are a frequent threat, local communities have disaster plans for use when a tornado strikes. On the other hand, many portions of the Atlantic coast have not been exposed to hurricanes in recent years. At the same time, they have experienced large population influxes. The result is that large numbers of residents are ignorant about hurricanes and the dangers they present. Similarly, a flash flood can occur in an area that has never before experienced one. Such a first-time flood in Big Thompson Canyon, Colorado, last summer took more than 135 lives. Warnings of such occurrences are often met with an attitude of "it can't happen here." NOAA's disaster survey report on the Big Thompson flood quotes a local resident as saying that while he had never been able to understand how people warned of imminent danger could disregard the warning, yet ". . . when they came to the door warning us to get out, I said 'Why? We've had hard rain before and got through it.' "

Disaster preparedness is a responsibility of the local community carried out through State and local public safety and disaster relief agencies. The National Weather Service, in cooperation with the Defense Civil Preparedness Agency, has a community preparedness program to assist local communities in developing emergency disaster plans. The NWS portion of this effort provides technical assistance to local authorities in increasing public awareness of weather disasters and developing suitable emergency disaster plans. This is accomplished primarily by full-time disaster preparedness meteorologists who analyze risks associated with hazardous weather, recruit and train volunteer observers and tornado spotters, and work with schools, hospitals, safety officials, and the news media to insure prompt and appropriate public response to weather warnings.

The National Weather Service has identified 39 offices as serving sufficiently disaster-prone regions to require coherent community preparedness effort. Funds and positions have thus far been provided to serve only 18 of these locations. To complete the program will require 23 additional positions and approximately $1.3 million per year in additional funding.

Since people's lives are on the line, NACOA considers it essential that NWS and DCPA be provided the resources to complete the weather disaster preparedness program.

An Adequate System

Over the past decade NWS has remained approximately level-funded and level-staffed. During this time it has made a major effort to automate as much of the work as possible, in order to leave personnel free for tasks that cannot be accomplished by machines. We are concerned that it may have fallen behind in measures needed to make its increasingly automated system reasonably fail-safe through system redundancy, and that it lacks the personnel to effect quick repairs or to take over by manual means in the event of breakdowns of essential automated equipment.

One of the advantages of an automated observation system is that it permits installation of instruments at remote locations. Such locations, by the same token, are not readily accessible for maintenance or backup observation in the event of failure of the automatic readout features. To maintain sufficient personnel to fully compensate for the loss of automated equipment could cost as much as $19 million per year. A series of complicated trade-offs must be made, taking into account spatial distribution of observing stations, reliability, and cost to arrive at an optimal decision. We believe an overall review of the system would aid in assessing the extent of appropriate trade-offs.

PROJECTIONS OF MONTHLY AND SEASONAL WEATHER

Generally speaking, weather forecast skill is greatest for periods of 12 to 48 hours and decreases rapidly thereafter. Although some kinds of forecasts (precipitation amounts, for example) are not as good as might be desired, we believe that, on the whole, forecasts of local weather 1 or 2 days ahead by the National Weather Service are up to the state-of-the-art.

The situation concerning longer range forecasts is less satisfactory. NWS currently prepares 5-day forecasts and 30- and 90-day outlooks. These are less detailed than the daily forecasts, and are intended to describe the general nature of the weather conditions expected to characterize a region over an extended period of time. The 30- and 90-day outlooks, for example, take the form of maps showing areas of the Nation expected to experience above average, near average, and below average temperature and light or heavy precipitation. The accuracy of these forecasts is low. This is especially unfortunate in view of the potential utility that reliable 30- and 90-day forecasts would have for agricultural planning, food distribution, and energy resource allocation—increasingly important as reserves of food and fuel shrink.

Forecasting for more than 2 or 3 days in the future has, at present, a very narrow scientific basis. It is not even known how far ahead it may ultimately be possible to forecast with any significant degree of skill.

In view of the tremendous potential payoff we are struck by the paucity of research effort addressing this problem. There are some commendable efforts underway, especially in conjunction with the Global Atmospheric Research Program, but apart from this, the research effort to improve monthly, seasonal, and annual predictions is virtually nil. We strongly urge a stepped up research effort in this area. Such research (both in-house and extramural) should not be conducted and funded solely by NWS and by NOAA's Environmental Research Laboratories. A coordinated Federal program should be developed involving these agencies with responsibilities in agriculture, energy, defense, and fisheries, as well as the National Science Foundation. Academic and other non-Federal research institutions should play a role.

We note that two bills currently pending in the Congress (H.R. 6669 in the House of Representatives and S. 421 in the Senate) would establish a National Climate Program, one aspect of which would involve research into climate fluctuations on just this time scale. Both bills provide for the joint efforts of a number of Federal agencies in this area. We urged passage of such legislation last year and we continue to do so. The program envisaged in these two bills would, among other things, fill the need with which we are concerned here.

RESPONSE TO NEEDS OF OTHER AGENCIES

The National Weather Service is severely constrained in both funds and personnel, and is unable to provide many services that it considers important, such as completion of a nationwide teletypewriter system for providing current weather information promptly to the news media. It also lacks the personnel to provide services requested of it by other agencies on a reimbursable basis.

The Office of Management and Budget, in a policy originally established by Circular A-62 in 1963, has specified that "The Department of Commerce, to the maximum extent practicable and permitted by law, will provide those basic meteorological services and supporting research needed to meet the requirements of the general public or the common requirements of other agencies," and that it will "to the extent consistent with effective and economical use of resources, conduct the specialized (meteorological) services that support the mission requirements of user agencies." However, arranging for such specialized services is the responsibility of the user agency. An interagency coordinating mechanism—the Federal Committee for Meteorological Services and Supporting Research—has been established to expedite this arrangement.

A serious problem has arisen concerning specialized weather services needed by other agencies for purposes clearly related to their own missions, but for which the necessary expertise resides within NWS. Even

though the user agency is willing to pay for such services, personnel constraints often prevent NWS from providing them. OMB should see to it that NWS has the means for providing services for which OMB holds it responsible. The most direct way is to increase the NWS personnel ceilings for adequate performance on reimbursable projects. Another alternative is to authorize agencies requesting specialized services on a reimbursable basis to transfer positions as well as funds to NWS for this purpose.

Preservation Of Historical Weather and Ocean Records

The evolving nature of science continually raises new questions regarding natural phenomena whose answers can often be found by new looks at observations taken for other purposes. For example, we are now beginning to investigate the many ways in which changes in our environment affect society. Changing climate can alter established patterns of crop production and demand for energy and water. Changing ocean currents can cause shifts in fish populations and induce climatic changes over land. These are likely to trigger secondary effects with economic, demographic, and political consequences.

A better understanding of environmental change would permit us to prepare for the consequences. It is important to know whether observed changes are likely to be short-term fluctuations or precursors of major trends. Such an understanding requires study of many decades of data, possible only if information collected in the past is preserved in a form that permits ready retrieval.

But it takes money, physical space, computers, and personnel to store and retrieve data, and the archiving agencies must critically assess the potential value of these records. Not all information is equally valuable. The challenge is to decide which data are likely to be worth keeping and to store them in a way that is cost-effective, space-effective, reasonably secure from loss due to fire, flood, or other hazards, and at the same time keeps them readily available when needed.

NOAA's Environmental Data Service (EDS) archives meteorological records at the National Climatic Center in Asheville, North Carolina, and oceanic records at the National Oceanographic Data Center in Washington, D.C.

Information accumulates very rapidly. For example, a geostationary weather satellite transmits the equivalent of about 200 reels of magnetic tape each day. The cost of storing all the data is great, and the usefulness of much of it may be small. Yet someone in the future may want just such data. What is needed is a procedure for deciding, in close consultation with potential users, what data should be archived and what should be discarded. To this end, we recommend that NOAA draw upon the National Academy of Sciences and the National Academy of Engineering for guidance in its decisions about which records to keep.

We applaud EDS' current efforts to reduce its many original records to microform and magnetic storage, and to develop indexing and retrieval procedures. This will do much to reduce the storage space needed and the time and manpower required for future storage and retrieval. It will also reduce the danger of losing legibility as paper deteriorates. We are concerned, however, that insufficient resources have been applied to safeguarding records from fire and other disasters. We urge that all key irreplaceable records be retained in duplicate at separate locations to reduce the risk of total loss.

Status Reports

NACOA has considered a variety of issues in the past which it continues to follow with interest. Among these are aquaculture, research on weather modification, the need for a national climate program, coastal zone management, and the status of the GLOMAR EXPLORER. On these topics, NACOA makes no recommendations or assessments at this time, as activities are currently underway that may have considerable bearing on progress. The following is a brief commentary on progress and changes to date in the five selected areas.

Aquaculture

As the world fish catch approaches its maximum potential, increasing attention is being paid to whether aquaculture, or "fish farming" in both fresh and saltwater, can significantly increase our production of fish and fish products for food and other purposes. While worldwide production of fish through aquaculture is only a small part (10 percent) of total fish production, it is even smaller (2 percent) within the United States. Moreover, aquaculture is lagging within our Nation, while it is expanding throughout the rest of the world.

In the fall of 1976, at the request of NOAA's National Marine Fisheries Service, the National Academy of Sciences undertook a study to determine

(1) why progress in aquaculture in the United States is slower than in other portions of the world;

(2) whether aquaculture can, potentially, make a significant contribution to U.S. food production; and

(3) whether the Federal Government should take steps to stimulate the growth of aquaculture, and if so, what the Federal role should be.

The Academy study will attempt to identify the constraints–scientific, economic, legal and those associated with production system technology–that appear to be holding us back. The Academy's Committee on Aquaculture hopes to be able to issue its report by the end of 1977.

Weather Modification Research

NACOA has repeatedly urged a coordinated Federal effort to support the basic research needed to bring weather modification to the point of being an operational tool resting on a sound technical base. We have pointed out that while weather modification operations and research are carried out in a number of Federal agencies for purposes connected with their individual missions, major gaps remain–largely because no one agency has the responsibility for identifying and supporting those areas of basic study needed for further progress along a broad front.

In October 1976, P.L. 94–490, the "National Weather Modification Policy Act of 1976," became law. This Act directs the Secretary of Commerce to conduct a 1-year study and on the basis of this to recommend to the President and to the Congress a national policy on weather modification, a Federal program to implement this policy, and organizational and legislative actions needed to put this program into effect.

Because of a delay in appropriating funds, this study was slow in getting started. However, in April the Secretary appointed a 17-member Weather Modification Advisory Board to develop the basis for her recommendations to the President and to the Congress. We understand that funds will be provided for this study, and that legislation has been introduced delaying the date by which the Secretary's report must be submitted in order to permit the Board to do an adequate job.

A National Climate Program

In previous reports, NACOA has urged establishment of a national climate program to conduct climatic monitoring and research and to assess the impacts of climatic fluctuations on our society.

We are pleased to note that a bill to establish just such a program (H.R. 6669, the National Climate Program Act of 1977) has been reported formally to the House of Representatives by its Science and Technology Committee and that a similar bill, S. 421, is pending in the Senate. We hope that before the year is out, we will see legislation enacted to bring a national climate program into being.

We caution, however, against expecting too much too soon–especially in the area of climate prediction. An adequate scientific basis for such predictions does not now exist, and while we urge continued research in this direction, we believe the more immediate prospects are

for incorporation of statistical climatic assessments into our thinking and especially into the development of contingency plans in the fields of energy and agriculture. It is important to know the risks of adverse climate affecting crop production, for example, and to recognize the onset of unfavorable conditions as early as possible so that society can have as much time as possible to adjust. It is similarly important that we understand as well as we can just what the effects of a season or a year of unfavorable climate are likely to be. It is information of this sort that we hope a national climate program will begin to provide.

Progress in Coastal Zone Management

NACOA noted last year that the then pending amendments to the Coastal Zone Management Act of 1972 would do much to provide a mechanism for making decisions in balancing the use of the coastal zone for development, recreation, and conservation. It is encouraging that as a result of these amendments the first State allotments under the Coastal Energy Impact Fund have already been made to 30 States and three Territories to mitigate the onshore impacts of coastal energy projects. Of special importance are the provisions that ensure that activities on the Outer Continental Shelf are consistent with State coastal zone management plans.

As the year drew to a close, three States had moved from the planning to the management phase of their coastal programs, and several others are expected soon to accomplish this transition. As this occurs, it becomes increasingly important that agreement be reached on administration of the "Federal consistency" provision of the Coastal Zone Management Act. This provision requires that Federal projects directly affecting a State's coastal zone must, to the maximum extent practicable, be consistent with the State's approved management program, but establishing regulations to put it into effect has been a complex process.

A number of Federal agencies had expressed concern that the Federal consistency provision could seriously impede their activities in coastal areas. As a result, the Office of Management and Budget (OMB) has intervened to assure that regulations in connection with this provision will permit Federal agencies to move forward with their coastal-related responsibilities while conforming to approved State coastal zone management programs to the maximum extent practicable.

In seeking Federal approval of coastal zone management plans, States must deal with counties, cities, and other levels of government established by State constitutions. Executive and legislative branches of the State governments are involved, and local and regional bodies must participate. There may be local opposition to the imposition of State

or Federal standards and requirements that are a necessary part of the State's coastal zone management plan. Some States are finding it difficult to pass legislation and establish the kind of regulations needed for Federal approval for implementation of the plan.

GLOMAR EXPLORER

In its Fifth Annual Report, NACOA discussed its concern that the GLOMAR EXPLORER, having been declared excess for U.S. Federal needs, might be scrapped if no user were found in government or industry able to afford to use this vessel. The vessel had been placed with GSA for sale or lease, and it appeared likely that no bid acceptable to the government would be made.

The GLOMAR EXPLORER represents both a large financial commitment and a unique U.S. engineering capability for deep ocean exploration and recovery. This ship has, for example, an extraordinary lift capability and a stabilized working platform with unusual motion compensation features. It has a large pipe storage capability coupled with a highly efficient pipe handling system. In NACOA's judgment, the potential value of this national asset is well worth the cost of maintenance and repair of this unique vessel when balanced against its economic value as scrap or the cost of replacing it should the need arise. In consequence, late last year NACOA undertook to prevent the possible scrapping of the vessel, and urged the President to take steps to have the Federal Government maintain the ship in good condition for possible future use.

The GLOMAR EXPLORER is now deactivated and preserved at Suisan Bay, California. The vessel is under consideration for use in deep sea drilling work by some Federal and private interests.

Appendix I

Public Law 92-125
92nd Congress, H. R. 2587
August 16, 1971

An Act

85 STAT. 344

To establish the National Advisory Committee on the Oceans and Atmosphere.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, There is hereby established a committee of twenty-five members to be known as the National Advisory Committee on Oceans and Atmosphere (hereafter referred to in this Act as the "Advisory Committee"). National Advisory Committee on Oceans and Atmosphere. Establishment.

SEC. 2. (a) The members of the Advisory Committee, who may not be full-time officers or employees of the United States, shall be appointed by the President and shall be drawn from State and local government, industry, science, and other appropriate areas.

(b) Except as provided in subsections (c) and (d), members shall be appointed for terms of three years.

(c) Of the members first appointed, as designated by the President at the time of appointment—

(1) nine shall be appointed for a term of one year,

(2) eight shall be appointed for a term of two years, and

(3) eight shall be appointed for a term of three years.

(d) Any member appointed to fill a vacancy occurring prior to the expiration of the term for which his predecessor was appointed shall be appointed only for the remainder of such term. A member may serve after the expiration of his term until his successor has taken office.

(e) The President shall designate one of the members of the Advisory Committee as the Chairman and one of the members as the Vice Chairman. The Vice Chairman shall act as Chairman in the absence or incapacity of, or in the event of a vacancy in the office of, the Chairman. Chairman and Vice Chairman

SEC. 3. Each department and agency of the Federal Government concerned with marine and atmospheric matters shall designate a senior policy official to participate as observer in the work of the Advisory Committee and to offer necessary assistance. Senior policy official.

SEC. 4. The Advisory Committee shall (1) undertake a continuing review of the progress of the marine and atmospheric science and service programs of the United States, and (2) advise the Secretary of Commerce with respect to the carrying out of the purposes of the National Oceanic and Atmospheric Administration. The Advisory Committee shall submit a comprehensive annual report to the President and to the Congress setting forth an overall assessment of the status of the Nation's marine and atmospheric activities and shall submit such other reports as may from time to time be requested by the President. Each such report shall be submitted to the Secretary of Commerce who shall, within 90 days after receipt thereof, transmit copies to the President and to the Congress, with his comments and recommendations. The comprehensive annual report required herein shall be submitted on or before June 30 of each year, beginning June 30, 1972. Duties. Reports to President and Congress.

Pay.

SEC. 5. Members of the Advisory Committee shall, while serving on business of the Committee, be entitled to receive compensation at rates not to exceed $100 per diem, including traveltime, and while so serving away from their homes or regular places of business they may be allowed travel expenses, including per diem in lieu of subsistence, in the same manner as the expenses authorized by section 5703 (b) of title 5, United States Code, for persons in Government service employed intermittently.

80 Stat. 499.

Department of Commerce and other agencies, assistance.

SEC. 6. The Secretary of Commerce shall make available to the Advisory Committee such staff, information, personnel and administrative services and assistance as it may reasonably require to carry out its activities. The Advisory Committee is authorized to request from any department, agency, or independent instrumentality of the Federal Government any information and assistance it deems necessary to carry out its functions under this Act; and each such department, agency, and instrumentality is authorized to cooperate with the Advisory Committee and, to the extent permitted by law, to furnish such information and assistance to the Advisory Committee upon request made by its Chairman, without reimbursement for such services and assistance.

Appropriation.

SEC. 7. There is hereby authorized to be appropriated to the Secretary of Commerce $200,000 for the fiscal year ending June 30, 1972, and each succeeding fiscal year to carry out the purposes of this Act.

Approved August 16, 1971.

LEGISLATIVE HISTORY:

HOUSE REPORT No. 92-201 (Comm. on Merchant Marine and Fisheries).
SENATE REPORT No. 92-333 (Comm. on Commerce).
CONGRESSIONAL RECORD, Vol. 117 (1971):
May 17, considered and passed House.
Aug. 2, considered and passed Senate, amended.
Aug. 5, House concurred in Senate amendments.

Public Law 92-567
92nd Congress, H. R. 15280
October 25, 1972

An Act

To amend the Act of August 16, 1971, which established the National Advisory Committee on Oceans and Atmosphere, to increase the appropriation authorization thereunder.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That section 7 of the Act of August 16, 1971 (Public Law 92-125; 85 Stat. 344), is amended to read as follows: "There are hereby authorized to be appropriated to the Secretary of Commerce, for the fiscal year ending June 30, 1973, and for each of the two fiscal years immediately thereafter, such sums, not to exceed $400,000, as may be necessary for expenses incident to the administration of this Act, and for succeeding fiscal years only such sums as may be authorized by law.".

National Advisory Committee on Oceans and Atmosphere. Appropriation authorization, increase. 33 USC 857-12.

Approved October 25, 1972.

LEGISLATIVE HISTORY:

HOUSE REPORT No. 92-1467 (Comm. on Merchant Marine and Fisheries).
CONGRESSIONAL RECORD, Vol. 118 (1972):
Oct. 11, considered and passed House.
Oct. 13, considered and passed Senate.
WEEKLY COMPILATION OF PRESIDENTIAL DOCUMENTS, Vol. 8, No. 44:
Oct. 28, Presidential statement.

Public Law 94-69
94th Congress, H. R. 5447
August 5, 1975

An Act

To amend the Act of August 16, 1971, as amended, which established the National Advisory Committee on Oceans and Atmosphere, to increase and extend the appropriation authorization thereunder, and for other purposes.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That section 7 of the Act of August 16, 1971, as amended (Public Law 92-125, 85 Stat. 344; Public Law 92-567, 86 Stat. 1181), is amended to read as follows: "There are hereby authorized to be appropriated to the Secretary of Commerce such sums as may be necessary for expenses incident to the administration of this Act, not to exceed the following amounts: (1) $400,000 for the fiscal year ending June 30, 1973, and for each of the 2 fiscal years immediately thereafter; (2) $445,000 for the fiscal year ending June 30, 1976; (3) $111,250 for the transitional period (July 1 through September 30, 1976); and (4) $445,000 for the fiscal year ending September 30, 1977.".

National Advisory Committee on Oceans and Atmosphere. Appropriation authorization. 33 USC 857-12.

SEC. 2. Section 4 of such Act (33 U.S.C. 857-9) is amended—

(1) by inserting after "review of" and before "the progress" the following: "national ocean policy, coastal zone management, and"; and

(2) striking out "the President." at the end of the second sentence thereof and inserting in lieu thereof "the President and the Congress.".

Reports to Congress.

Approved August 5, 1975.

LEGISLATIVE HISTORY:

HOUSE REPORT No. 94-222 (Comm. on Merchant Marine and Fisheries).
SENATE REPORT No. 94-268 (Comm. on Commerce).
CONGRESSIONAL RECORD, Vol. 121 (1975):
May 19, considered and passed House.
July 11, considered and passed Senate, amended.
July 24, House concurred in Senate amendments.

THE SECRETARY OF COMMERCE
Washington, D.C. 20230

September 23, 1977

Sirs:

I have the honor to transmit, in accordance with Public Law 92-125, August 16, 1971, the Sixth Annual Report of the National Advisory Committee on Oceans and Atmosphere (NACOA).

Enclosed also are my comments and recommendations that are required by the Act. These comments include further information on actions taken pursuant to the recommendations in the Fifth Annual Report of NACOA as required by the Federal Advisory Committee Act.

Sincerely,

Juanita M. Kreps

Enclosures

The President
President of the Senate
Speaker of the House of Representatives

COMMENTS OF THE SECRETARY OF COMMERCE ON THE SIXTH ANNUAL REPORT OF THE NATIONAL ADVISORY COMMITTEE ON OCEANS AND ATMOSPHERE

PREFACE

Public Law 92–125, which established the National Advisory Committee on Oceans and Atmosphere (NACOA) required that the annual report of the Committee "shall be submitted to the Secretary of Commerce who shall within 90 days after receipt thereof transmit copies to the President and to the Congress with his comments and recommendations." Accordingly, I have reviewed the Sixth Annual Report of NACOA and have incorporated the viewpoints of all interested Federal agencies in these comments and recommendations.

INTRODUCTION

This Sixth Annual Report of the National Advisory Committee on Oceans and Atmosphere (NACOA) touches upon a wide variety of significant atmospheric and oceanic issues which confront our Nation. The Committee has urged an approach to our many and varied uses of the sea as well as recommending actions in the areas of air pollution monitoring, and weather forecasts and warnings. As in previous reports of the Committee, the issues involved are complex and in many ways their resolution will impact the economic and social welfare of the United States. The findings and recommendations deserve our comment and response.

My comments are organized in the same sequence as the chapters of the Sixth Annual Report. Where the Committee has made

recommendations pertaining to the work of a specific agency, I have included the verbatim response of that agency.

Uses of the Sea: U.S. Goals in a Changing World

RECOMMENDATION:

- The Congress, through legislation such as S. 447, modified as discussed in the text of this report, or the President should establish in the White House a Cabinet-level Marine Affairs Council chaired by the Vice President to develop a national marine strategy and to coordinate Federal agency programs for its implementation. This is needed in addition to greater organizational consolidation of agency marine programs discussed in previous NACOA reports.

The report discusses the alternatives for planning ocean use management and coordinating Federal agency programs, and recommends that a Marine Affairs Council be established to accomplish these functions. I recognize the necessity for dealing effectively with these questions and will ensure that they are included in the major oceans policy review we are undertaking.

The Department of Commerce, in cooperation with other interested Departments, is conducting a comprehensive ocean policy study. The study will provide a thorough and objective review of the current state of federal ocean policy, ongoing federal ocean programs, and major ocean issues. The study should serve as a basis for developing subsequent program, budgetary, legislative, and organizational recommendations, where appropriate and necessary.

Upon completion of the study, other Cabinet officers and I will prepare recommendations for Presidential action. These recommendations will seek to take advantage of the opportunity to work cooperatively with the Congress to improve the effectiveness of federal ocean programs, to streamline federal relationships with the states and the private sector, and to provide for a comprehensive and consistent federal approach to the development of ocean related policies.

We will consider the recommendations of NACOA as we move toward implementing, within the Federal establishment, those organizational mechanisms which we believe best suited for management and coordination of our ocean programs.

The report further discusses changing uses of the sea. In that regard, the Department of Defense has stated that the reference in the report to the availability of "... fewer reliable foreign bases ... will have major impact on our naval capabilities ..." overstates the case. Military planning must of necessity consider such contingencies and assure that alternatives are available to reduce the impact. Moreover, we are not presently engaged in major decisions involving base losses—our decisions concern negotiations for continuing use of these bases.

NACOA also indicates that Navy has a responsibility as a peacetime stabilizing influence but expresses an uncertainty as to whether this responsibility is being assumed by Navy. The Department of Defense stated that the peacetime role of naval forces in deterring hostile action (i.e., acting as a "stabilizing influence" at points critical to "our vital needs") is in fact a fundamental element of naval strategic planning.

On the issue of requiring shipment of cargo in vessels under the flag of the originating nation, the Department of State believes that the report gives the impression that it is the developed maritime nations with overcapitalized merchant fleets which are beginning to establish policies requiring that a portion of their shipping be carried in their own vessels. In fact, it is primarily the developing nations which wish to establish merchant fleets to establish such cargo preference policies.

Energy and the Sea

RECOMMENDATIONS:

- The Secretary of the Interior should expedite the bringing of new offshore sources of oil and gas to a production-ready state. An important step is to develop offshore environmental and safety regulations clearly adequate to meet the concerns of the States and the public, that are at the same time stable, subject only to major new findings, and that provide a dependable investment climate for bidding.
- The U.S. Geological Survey and the U.S. Coast Guard should jointly undertake an analysis of the human error problem as it relates to safety of offshore oil operations and establish measures for its control.
- ERDA's solar energy program should give priority to the advanced technology required for the ocean thermal energy conversion development program and to the systems aspects of the

wave energy conversion process where the technology is well in hand.

The development of offshore energy resources is primarily the responsibility of the Department of the Interior, assisted by several other government agencies including the Department of Commerce, Department of Transportation (DOT), the newly established Department of Energy (DOE), and the Environmental Protection Agency (EPA). The Department of the Interior has submitted the following comments on the recommendations of the Committee:

> NACOA's recommendation that new offshore sources of oil and gas be brought expeditiously to production-ready state is a desirable objective. However, we must also take into account the national objectives of safety and environmental protection. We are committed to a balanced approach that gives the fullest possible environmental protection while meeting reasonable production goals.
>
> With respect to NACOA's recommendation to undertake an analysis of human error in the safety of offshore oil and gas operations, the Department's Geological Survey is upgrading its requirements for training of industry personnel in critical operations. Through mandatory training requirements we believe we can substantially improve the safety of OCS operations. We are not convinced of the need for licensing supervisors in the manner suggested by NACOA, although we will continue to examine this option.

Concerning these two recommendations, the Environmental Protection Agency provided the following comments:

> Again, as in previous years, the Committee advises the expedited development of off-shore mineral resources, primarily for energy, and recognizes the need to do so in ways that are environmentally safe. The Committee has, in former reports, advised that the technology for off-shore development was adequate to assure marine environmental protection. In view of the recent North Sea oil well blow-out incident, the Committee has shifted its attention to human error in the use of available technology. The question of whether the technology is adequate but the users failed, or that the technology is not adequate in the hands of its users, seems to us to be moot. It is clear that off-shore drilling remains a serious hazard to the marine environment, and I wish to repeat Environmental Protection Agency's (EPA) concerns expressed in response to NACOA's fourth and fifth annual reports. Off-shore development of mineral resources should proceed only with full recognition of the need for obtaining the scientific information and technology necessary to assure that decisions for off-shore development are environmentally sound.

The Energy Research and Development Administration (ERDA) believes that the status of OCS exploration and production is well documented and many of the recommendations are sound, but ERDA urges that all recommendations be reviewed within the context of the National Energy Policy for a coordinated program of energy development.

The program approach recommended by NACOA under the heading "Nonfossil Energy from the Sea" is already being followed by ERDA. Amplifying on the statements concerning biomass conversion for energy production and OTEC, ERDA states that the main emphasis of the biomass conversion is on terrestrially-grown organic material. However, a low level long range research program on biomass from the sea is underway in the event that development of this energy source becomes feasible in the future.

NACOA expressed concern that "continuation of the status quo" with regard to our nation's present reliance on foreign energy sources may eventually leave the United States only "unacceptable options" if foreign producers of energy were to restrict their exports of energy to us. Contrary to the implication which might be drawn from this section of the chapter, the Department of State maintains that the President's Energy Program is not a policy of relying on the "continuation of the status quo." A primary goal of the National Energy Plan is to reduce the dependence of the United States on foreign energy sources and to lessen our vulnerability to supply interruptions. Steps have already been taken to reduce vulnerability to supply interruptions by international cooperation through the International Energy Agency, and by development of the Strategic Petroleum Reserve. Measures such as these, together with the implementation of the National Energy Plan, will enable the United States to maintain healthy economic growth and avoid the "unacceptable options" portrayed in the NACOA Annual Report.

Finally the Secretary of Transportation commented on design and safety of offshore drilling rigs:

> Under the OCS Lands Act, the Department of the Interior has the jurisdiction for the design and safety procedures regarding the structure and drilling equipment for offshore rigs. The Coast Guard has the responsibility for the lights and other warning devices and safety equipment, i.e., fog signals, firefighting equipment, life

rafts. Also the Coast Guard now certifies tankermen on vessels as well as enforces the relevant safety standards of all vessels involved in the exploration or drilling process. To facilitate interagency cooperation in this regard, there is a CG/DOI memorandum of understanding. At the present time some consideration is being given by the relevant agencies, including DOT's Materials Transportation Bureau, to the possibility of requiring some form of certification for offshore oil rigs.

In regard to the overall discussion of safety in the development of offshore oil and gas resources, it is also submitted that both safety and protection of the marine environment must be given equal priorities in any accelerated development of the U.S. Continental Shelf.

Marine Transportation

RECOMMENDATION:

- The Merchant Marine Act should be amended to update and clarify economic and military goals and priorities for the U.S. merchant marine and to provide for a proper allocation of resources in light of these priorities.

The issue of maritime (as distinct from marine) policy coordination remains. NACOA recommends that this issue be taken up by the National Security Council (NSC) and that the NSC consider establishing a standing interagency committee on Federal maritime policy. In our view, improved coordination of maritime policy would be desirable. Whether or not it should be accomplished by an interagency committee subordinate to the NSC is another matter. While national security requirements constitute an important part of the justification for the Federal maritime program, there is also a need to provide commercial service, and there has long been a policy of dependence for national security purposes on ships that can be at least partially self-supporting in commercial service. This arrangement was described well in the 1977 report of the Chairman of the Committee on Merchant Marine and Fisheries on the *Oversight Hearings before the Merchant Marine Subcommittee with Respect to U.S.-Flag Merchant Marine:*

It is clear, that for the most part, the Government relies on the commercial marketplace for national security sealift and shipbuilding requirements. To the extent that the merchant marine sustains itself in ordinary operations, it absorbs costs that would otherwise be costs to the Federal Government. However, in the

situation where American merchant ships cost more to build and operate than foreign flag competitors, such costs cannot generally be met entirely on commercial account, and the Government steps in with various subsidies that are intended to give the American-flag operator a rough sort of parity with foreign competitors. Even with this assistance, the private market is expected to supply the preponderant capital investment and the return that makes any investment possible. One of the objects of the current subsidy system is to procure national security at minimum Federal outlay, and to the greatest degree possible as a by product of commerce."

While it is clearly appropriate for the NSC to oversee an assessment of marine programs needed for national security and defense, as such, the merchant marine problem is not limited to those areas. It involves both commercial and national security objectives and the two are inextricably linked. In this light, the responsibility for coordinating maritime policy should be placed at a level where the interrelated needs of both commerce and national security will be assured of recognition.

The reconciliation of commercial and national security imperatives in the maritime program and in maritime policy poses a problem which is the subject of the continuing dialogue between MARAD and the Navy.

The Department of Transportation has pointed out that there are a wide range of economic, social and political issues which must be integrated into marine transportation policy options. Intermodal transportation issues and regulatory influences under legislation such as the Ports and Waterways Safety Act must additionally be programmed into overall marine transportation policy.

The DOT also states that there is a close correlation between maritime and ocean policy and national transportation policy which should not be overlooked.

Fisheries

RECOMMENDATIONS:

- In drafting regional management plans, the Regional Fishery Management Councils should view limited entry as an eventual necessity to protect the stocks from overfishing and the consumer from rising prices to support an overcapitalized industry.

However, since regional conditions differ, the Secretary of Commerce should make sure an opportunity for study and debate is provided before approving any specific regional plan for limited entry.

- The Secretary of Commerce, in consultation with the State Governors, should establish guidelines for selecting appointed members of the Regional Fishery Management Councils with the broad viewpoint and experience needed to relate special interests to the public good.
- The Congress should amend the Marine Mammal Protection Act of 1972 to remove inconsistencies and ambiguities which hamper efforts to regulate the killing of marine mammals.
- The National Marine Fisheries Service should expand its efforts to acquire accurate data on porpoise population levels and population dynamics needed as a firm basis for regulation.

The Fishery Conservation and Management Act of 1976 specifically requires advisory committees and public hearings by the Regional Councils. All fishery management plans and changes to plans have been and will continue to be subject to study and debate. Recognizing the controversy and lack of understanding of limited entry, NOAA is scheduling a symposium on limited entry to be held later this year.

Section 302 of the Act is explicit as to procedures for appointment and the qualifications of the individuals nominated to become members of a Regional Fishery Management Council. Our experience is that the candidates nominated by the state governors have met the criteria of the Act. Selection from the lists submitted by the governors is done with the objective of obtaining the broad viewpoint and experience as suggested by NACOA. On the basis of the first year of operation, we believe our selection process has achieved this broad balance and reasonable objectivity.

Concerning the need for amendment to the Marine Mammal Protection Act, we have engaged in discussions with the appropriate committees of the Congress. As of this date, the need and form of Congressional action is still under discussion within the Congress.

The National Marine Fisheries Service has expanded its efforts to acquire accurate data on porpoise population levels over the past few years. The fiscal year 1978 NOAA budget further increases our level of tuna/porpoise research.

RECOMMENDATIONS:

- Domestic deep seabed mining legislation should be enacted to make it economically feasible for U.S. industry to proceed with development and production of deep seabed minerals. The legislation should be clearly interim or transitional, and should include the provisions that the United States supports in the United Nations Conference on Law of the Sea negotiations now underway. Among these are environmental protection and some form of revenue sharing with the international community.
- The U.S. delegation to the United Nations Conference on Law of the Sea should press for major changes in the Revised Single Negotiating Text to permit research in the economic resource zones of all countries under reasonable conditions of cooperation and sharing in the benefits of research.
- The State Department should reexamine and clarify the purposes behind U.S. participation in specialized international agencies and should assist U.S. delegations in providing strong leadership to refocus proceedings on matters germane to the agency charters.

The Department of State provided the following analysis on the NACOA recommendations relating to the law of the sea:

> Regarding law of the sea issues, NACOA has recommended the enactment of domestic deep seabed mining legislation designed to make it economically feasible for U.S. industry to proceed with development and production of deep seabed minerals. NACOA has also recommended that the U.S. Delegation to the Third United Nations Conference on the Law of the Sea press for major changes in the Revised Single Negotiating Text to permit research in the economic zones of all countries under reasonable conditions of cooperation and sharing in the benefits of the research.
>
> The Informal Composite Negotiating Text resulting from the just-concluded session of the Law of the Sea Conference, which was not available when NACOA forwarded its report, substantially sets back prospects of agreement on an international regime for the conduct of deep seabed mining. The substance of the text on this issue and the lack of fair and open processes in its final preparation lead to the conclusion that our Government must review not only the balance among our substantive interests, but also whether an agreement acceptable to all governments can best be achieved through the kind of negotiations which have thus far taken place. The issue of deep seabed mining legislation will be

considered in this review process and, therefore, comment on NACOA's recommendation for enactment of deep seabed mining legislation is not appropriate at this time.

The U.S. Delegation did, at this session, press for major changes to ease restrictions on marine scientific research. The new text reflects some, but not all, of the changes desired by the U.S. Unfortunately, the concept of a regime which requires the consent of the coastal state is still present, although there are some qualifications. The Department concurs in NACOA's recommendation, and will continue to press for improvements in the regime for marine scientific research.

Deep seabed mining and marine scientific research are, of course, but two of the issues within the Law of the Sea Conference of concern to the United States. As noted in the NACOA Report, the U.S. has a wide range of objectives in the Law of the Sea Conference. These objectives should be kept in mind when assessing the results of the most recent session. In this regard, real progress was made on important issues relating to navigation, overflight, and associated interests in the proposed 200-mile economic zone. In addition, continued progress was made in the design of a comprehensive system for the peaceful settlement of disputes relating to ocean uses.

The Department of State has stated also that it is in general agreement with NACOA's statement in the text of the report concerning the desirability of the United States continuing to concentrate on achieving our goals and objectives through present specialized international agencies while remaining alert to opportunities for improving the functioning of such agencies. It is the policy of the Department of State to minimize political controversy within the specialized international agencies, and to instead enhance the activities of these agencies on matters germane to their charters.

Concerning the NACOA comment on marine pollution control, the Department of Transportation believes that the statement that "NOAA and EPA share responsibility for controlling marine pollution" serves to confuse agency scientific and operational responsibilities. NOAA and EPA share responsibility for the investigation of the fates and effects of marine pollution and the setting of water quality standards in domestic waters. The U.S. Coast Guard has responsibility for the control, prevention and abatement of water pollution; this being a sole responsibility under the Ports and Waterways Safety Act and a shared responsibility with the EPA under the Federal Water Pollution Control Act as amended. It is this sub-

stantive jurisdiction which makes the Coast Guard responsible for developing oil discharge and other agreements within IMCO, the specialized agency of the United Nations concerned with the mitigation and control of global marine pollution.

Ocean Engineering

RECOMMENDATIONS:

- The Congress or the President should take action to direct (1) the Secretary of Commerce to support and foster programs to correct major technical deficiencies in civil ocean engineering and technology, and (2) the Secretary of the Navy to provide assistance as necessary.
- The Office of Science and Technology Policy should undertake a comprehensive, continuing review of the Nation's ocean engineering and undersea technology program, and should submit a periodic report to the President identifying significant technological problems and program inadequacies, and recommending remedial measures.

The need for programs to correct any major technical deficiencies in civil ocean engineering and technology will be considered in the ocean policy which the Secretary of Commerce is pursuing. I have directed the Administrator of the National Oceanic and Atmospheric Administration (NOAA) to cooperate with the Department of the Navy to the extent necessary in meeting our existing mission related responsibilities in civil ocean engineering and technology.

In response to the NACOA recommendations involving U.S. Navy participation in the civil ocean engineering, the Secretary of Defense recognized "that close technical interchange and cooperation between Navy and the civil sector, including the use of shared engineering and test facilities, is increasing."

The Office of Science and Technology Policy will be involved in the development of the Federal ocean policies. Continuing review of the Nation's ocean engineering and undersea technology program should come under OSTP's ongoing reviews of wide range engineering and technology needs for all sectors of the economy.

In commenting on this recommendation, the Department of Transportation advised that the report to the President should be in-

corporated in the overall report now required by Section 205 of P.L. 282 which established the Office of Science and Technology Policy. DOT concurs that the identification of overall technical gaps and needs in civil ocean engineering is appropriately a function of OSTP but submits that there is an array of opinion among the various agencies sharing ocean engineering development on the context and type of the deficiencies.

Finally, the Department of the Interior informed that, in the area of ocean engineering, it is currently implementing a verification process for offshore fixed oil and gas structures, as an integral part of its OCS enforcement program. This process will require special evaluations and derivation of acceptable, safe engineering design criteria and, as such is pertinent to NACOA's recommendation on ocean engineering.

Ocean Research and the Academic Fleet

RECOMMENDATION:

- The Federal Coordinating Council for Science, Engineering, and Technology, with advice from the University-National Oceanographic Laboratory System, should develop a national plan for maintaining an effective academic research fleet, and should recommend funding and timing to implement that plan. The National Science Foundation should be designated lead agency for implementing the plan.

The National Science Foundation is "pleased to see the discussion of ocean research and the academic fleet," and has "no fundamental disagreement with the Committee's observations and recommendations."

Educating the Public in Marine Affairs

RECOMMENDATIONS:

- The U. S. Office of Education, with the cooperation of the National Oceanic and Atmospheric Administration and the National Science Foundation, should support the development of educational materials on marine subjects and their incorporation into existing elementary and secondary curricula.
- The Office of Education should explore with the National Endowment for the Humanities possibilities for the develop-

ment of audiovisual supplements to the "Courses-by-Newspaper" Oceans Course, suitable for school and television use.

The U.S. Office of Education, of the Department of Health, Education and Welfare, has concurred with both of these recommendations. NOAA has entered into an interagency agreement with the Office of Education which established a formal cooperative relationship. This will result in mutually beneficient information exchange and interagency activities to stimulate a wide range of activities at the Federal, state, regional and local levels among marine and coastal-related fields and the educational community. The purpose of these joint activities is to encourage the development of an integrated and coordinated marine education program.

The National Science Foundation welcomes the comments on marine education and finds them wholly compatible with the Foundation's responsibilities in science education and improved understanding of science.

EPA Management of the Nation's Air Pollution Monitoring Programs

RECOMMENDATION:

- The Administrator of EPA should establish an Office of Measurement Science responsible for ensuring that data collected in EPA-approved air pollution monitoring programs are of uniformly high quality and comparability, and constitute a nationwide data base capable of serving a multiplicity of purposes in addition to supporting local air pollution control efforts. This office should report directly to the Administrator.

This recommendation is directed specifically to the Environmental Protection Agency (EPA). The Administrator of EPA, has submitted the comments that follow on the recommendation as well as the analysis contained in the body of the report:

The Committee has issued a critical analysis of 'EPA Management of the Nation's Air Pollution Monitoring Programs'. It concluded that the pollution monitoring data now being collected over the Nation are both insufficient and not of adequate quality to serve all required purposes, that the fragmentation of responsibility and authority for monitoring matters in EPA is the principal cause of air pollution monitoring deficiencies, and that the

resources given to monitoring within EPA are less than would seem consistent with its basic importance to the Agency.

We have recognized, and agree with the NACOA observation, that air monitoring data must serve many users and many purposes which may require several different network systems and methods. As a result of studies by the EPA over the past year and a half, we are now in the process of segregating the existing and prospective air monitoring networks into three categories for each of which proper criteria of siting, operation, and analysis will be established: State and Local Air Monitoring Stations designed to meet specific fixed-station monitoring objectives of State and local agencies and EPA Regional offices; National Air Quality Trend Stations which will supply data necessary for national assessment of trends and progress toward meeting National Ambient Air Quality Standards; and Special Purpose Monitoring to serve Federal, State and local needs in carrying out special studies over irregular time periods.

We also agree with NACOA that the complete range of operations in obtaining air monitoring data, no matter by whom, where or when, must be uniformly quality assured if the data are to be reliably useful for their intended purposes. The EPA's monitoring data quality assurance program as an Agency policy covers the full scope of functions identified by the Committee, and has been in continuous development and progressive operational implementation since 1972. This program is a continuation of pre-EPA antecedent programs initiated in the early 1960s. It is true, without question, that the program is not yet complete, not yet implemented over the complete breadth of monitoring functions, nor yet implemented throughout the State and local levels to the depth we consider necessary. We continue to work with determination toward these objectives. At this time we are engaged in a study to assess, modernize and reconstitute the quality assurance program that was established in 1972 to be certain that it will continue to be of maximum benefit and efficiency. We are in the process of directing that all State and local agencies must establish air monitoring quality assurance programs no later than September 1978. Beginning in October 1978 the EPA will accept air monitoring data only from systems operated under a formal quality assurance program. These steps are intended to result in more efficient use of monitoring resources by bringing forth data of greater reliability with more flexibility of application."

We understand and appreciate the intent of the Committee's recommendation that an Office of Measurement Science, reporting directly to me, be established to provide a focus of uniform policy and oversight over all EPA monitoring matters. As NACOA has detailed the functions of such an office, they are, almost completely, the functions of a fully constituted monitoring quality

assurance program. By a formal, deliberative process the EPA policy issued in April 1972 specified that the central responsibility for the EPA quality assurance program would reside in our Office of Research and Development. Thus, the single focus of oversight as advised by NACOA does exist. The extent to which this focus requires augmentation of authority or responsibility, or reconstitution of function to meet prevailing and foreseeable requirements is presently under study. This matter is also currently receiving the attention of my Science Advisory Board, and I look forward to their advice.

The decentralized delegation of monitoring authority and responsibility to the several operating components of EPA to meet their separate and different needs was also a product of the 1972 monitoring policy issuance. Creation of an Office of Measurement Science as NACOA recommends would require a major organizational restructuring of EPA. The interests, organization and procedures of all EPA program and Regional Offices would be involved. The present pattern of organization and functions throughout EPA has had five years of development and stabilization under current policy, and before changes are made in response to the NACOA recommendation as well as to a similar recommendation by the National Academy of Sciences, I wish to be certain that an alternative pattern would assure improvement.

We agree with the Committee's finding that additional resources would enable an improved base of high quality air monitoring data. The record shows that over the past several years there has been an escalation of resources devoted to monitoring. Over the past three years the rate of increase of monitoring resources in State and local agencies has exceeded the rate of increase of the total resources of those agencies. Within EPA, the present zero base budget process now in progress is intended to assure that imbalances of resources among the many Agency functions will be brought forth as issues for resolution by the highest levels of Agency management, which will include my personal attention. Every effort will be made within this process to set the monitoring resources budgets at levels wholly consistent with the importance of monitoring contribution to the Agency's many mission functions. A part of the consideration in this process is the matter of effective as well as efficient use of monitoring resources.

Weather Warnings and Forecasts

RECOMMENDATIONS:

- The National Weather Service should give high priority to upgrading its emergency warning service by a combination of system redundancy and manual backup to improve the reliability of automated systems, and by the use of more readily

understood language and more timely delivery of warning messages.

- The National Weather Service and the Defense Civil Preparedness Agency should accelerate completion of community preparedness program in areas of the Nation prone to weather disasters.

- The Federal Communications Commission should be authorized to issue regulations requiring radio and television licensees to broadcast promptly emergency warnings of life-threatening weather conditions as part of their public service obligations.

- The National Oceanic and Atmospheric Administration, National Science Foundation, Department of Agriculture, and Department of the Interior should give high priority to research on long-range weather forecasting and to coordinating their efforts to provide practical applications.

- The Office of Management and Budget should make arrangements to provide the National Weather Service with the personnel needed specifically for the purpose of providing reimbursable services to other Federal Agencies.

Since 1973 we have continued systematic program improvements designed to mitigate the social and economic impact of natural disasters on our Nation with generally favorable support by the Congress. Much progress has been made. Major program improvements now underway include modernization of the weather radar network, expansion of the NOAA Weather Radio program, and Automation of Field Operations and Service (AFOS). Unmet needs will be given due consideration in future planning to ensure a logical sequence of continued improvements in proper balance with other high priority programs and the availability of resources.

Concerning the discussion of ocean weather stations in the body of the report, the Secretary of Transportation provided these comments:

> In general, DOT endorses the recommendation in this section to improve weather observations, forecasts and the dissemination of weather warnings. With regard to the discussion on ocean weather stations some clarification is necessary. While it is true that the major factor in elimination of Coast Guard Ocean Weather stations was the inordinate cost of maintaining a multi-mission vessel for the sole purpose of data collection and observation, the withdrawal of these stations was done under the premise

that environmental data buoys would be developed as a more cost-effective substitute.

The Federal Communications Commission (FCC) states that all broadcast licensees have the statutory responsibility, pursuant to the Communications Act of 1934, as amended, to serve the public interest, convenience and necessity. The FCC does not believe that new rules should be adopted, at this time, due to the cooperative attitude of the broadcast industry in performing adequate public service.

It is my opinion that a full evaluation of potential impacts on the media should be made before attempting to correct what appears to be a lack of authority on the part of FCC to require radio and television licensees to broadcast emergency warnings promptly. We fully support the FCC position that federal regulations are not required. DOC supports an emergency preparedness effort on the part of communities, in which the voluntary participation of the local media is incorporated as part of the preparedness planning. Recognition of those stations which do an outstanding job in warning the public should be systematically provided, and the benefits to the public stressed in developing community preparedness programs in which the local media play a key role voluntarily.

I fully agree with the objective of the recommendation to direct increased efforts toward improving techniques and applications for long-range weather prediction. However, I strongly urge that a distinction continue to be recognized between the NOAA, NSF, and NASA responsibilities for research on prediction techniques and the responsibilities of the DOA and DOI as "user agencies" for developing improved applications of long-range prediction products. This clearly defined division of research responsibilities is recognized in the United States Climate Program Plan.

In connection with long-range forecasts for agriculture, the Secretary of Agriculture observed that NACOA properly calls attention to the importance of long-range weather outlooks for planning in various economic areas. The nation's farmers and agricultural programs would be among principal beneficiaries of improvement in the reliability and information content of these bulletins. The USDA will cooperate fully with other Departments and agencies in research and development on this problem.

On the same subject, it must be recognized that the DOD must be involved in any coordinated Federal program in long-range forecasting research. Indeed, the Department of Defense is the only custodian of many of the key operations and research efforts required to implement a long-range forecast effort. The continuing requirements within the Department of Defense for long-range forecast capabilities have for example resulted in programs such as the North Pacific Experiment (NORPAX) which until recently derived its support solely from Navy and the National Science Foundation. A major part of any program dedicated to the development of long-range forecasting capabilities is the basic meteorological research.

In regard to NWS provision of specialized services to other agencies, the Department of Commerce will continually reassess the allocation of its annual ceiling to assure that NWS is able to provide appropriate specialized services.

Preservation of Historical Weather and Ocean Records

RECOMMENDATIONS:

- The National Oceanic and Atmospheric Administration, with the advice of the community of users of environmental data, should identify those data which ought to be preserved and should develop appropriate means for their preservation. In particular, key archives of environmental data should be stored in duplicate at separate locations to reduce the risk of destruction or loss.

To remedy the situation, NOAA's Environmental Data Service (EDS) has developed a comprehensive Records Management Program, which will achieve the aim of NACOA's recommendation. One of the inputs to this program was a "Users Seminar" which was conducted to solicit the views of the users of environmental data.

In endorsing this recommendation, the Secretary of Transportation said that NOAA, as the intended focus for basic marine science, could then be truly supportive of the needs of the mission-oriented agencies.

Comments on the Fifth Annual NACOA Report

In complying with the provisions of Section 6 (b) of the Federal Advisory Committee Act, the following comments are provided as follow-up to the Secretary of Commerce (SOC) comments dated September 22, 1976 on the Fifth Annual NACOA Report of June 30, 1976.

Section I—Policy and Planning for Marine Affairs

- An ad hoc task force be established by legislation to formulate a comprehensive marine affairs policy, plans, and an adequate coordination mechanism;
- The scope of the policy and plan should cover (1) use of ocean space; (2) development and conservation of marine and coastal resources; (3) protection of the marine and coastal environments; (4) support and conduct of marine-related environmental research, ocean engineering development, surveys, and technical services; (5) training of personnel; and (6) support for national defense ocean technology.

No ad hoc task force was established by law; however, both the legislative and executive branches have established groups to formulate a comprehensive ocean policy. The study being conducted by the Secretary of Commerce in cooperation with other interested Federal Departments and Agencies will encompass the scope recommended in the NACOA Fifth Annual Report.

Section II—Energy from Offshore Sources

- As a nation we recognize the need to explore and develop offshore oil and gas resources consistent with enforceable, environmentally safe procedures and the need for maintaining strategic reserves, and that we reconcile the process with an economic atmosphere suitable for development.

No change from Secretary of Commerce (SOC) letter.

Section III—The Sea Grant Influence

- Funds be increased over the next 3 to 5 years from the present $23 million per year to a minimum of about $40 million, in order to enable Sea Grant to maintain a strong local and regional orientation for its educational activities, applied research,

and advisory services as an integral part of an effort directed towards national needs;

- The Sea Grant Act be amended to permit responsiveness to Federal-level requirements through provision of additional earmarked funds free of the matching fund requirements;
- Special attention be paid by the Administrator of NOAA to improving its goals, and setting its priorities within the national context; and
- Steps be taken by the Office of Sea Grant to improve its proposal review process, and to clarify the function, composition, and tenure of the Sea Grant Advisory Panel.

Proposal review procedures have been improved and a system for rotation of panel members has been instituted. The Sea Grant Improvement Act of 1976 authorized new national projects and international programs both of which are to be funded on an unmatched basis. Funds to initiate these two programs are included in the FY 78 budget.

Section IV—Energy Research and Demonstration

- There be established in ERDA a Directorate for Oversight of Energy Research whose functions it would be to act (in a manner analogous to the Director of Defense Research and Engineering of the Defense Department), as R&D advisor to the Administrator and as a group with no stake in any particular R&D approach, so that it can balance the many simultaneous avenues now being explored, and assist in shifting the priorities and keeping them current as information develops.

No change from SOC letter.

Section V—Air Pollution Research and Development

- EPA continue to maintain a strong R&D capability in direct support of its near-term regulatory functions; and that EPA conduct longer term basic research to the extent that resources permit;
- Lead agency designation be accorded in each of three major environmental areas, and that the following agencies accept the prime responsibility for leadership in assuring that there are no major gaps in the overall Federal program of longer-term environmental research directly involving:
  - human health and disease—National Institute of Environmental Health Sciences
  - the atmosphere and the oceans—National Oceanic and Atmospheric Administration

- plant and animal life on land and inland waters—Department of the Interior
- Council on Environmental Quality (CEQ) lead a high level interagency coordinating committee to assure appropriate policy guidance, establishment of priorities, and coordination of the several long-range research programs and of these programs with the EPA.

No change from SOC letter except EPA has continued to perform as much long term, basic environmental research as resources permit.

Section VI—Weather and Air Safety

- The Federal Aviation Administration put greater emphasis on the early recognition of deteriorating weather situations in civilian pilot training and on the requirement for weather knowledge in pilot certification;
- The National Weather Service improve the quality of air weather information by computer checks on observations, by post-mortems on forecasts, and by training in format and enunciation for voice communicators;
- Aviation weather expertise be put back into the traffic control environment and, especially, that the Kansas City Test (integrating controllers and professional weather personnel) be extended and developed throughout the Nation (for controlled flights) and the Enroute Flight Advisory Service (largely for general aviation) also be extended throughout the Nation.
- The agreements between, and the directives to, the National Weather Service and the Federal Aviation Administration, splitting the responsibility for aviation weather service, be reviewed and updated and the requirements for aviation weather service be reviewed in the light of technological advance on a broad front.

The experimental program of using meteorologists in the ARTCCs has not yet been expanded. The FAA has recommended expansion to all 20 ARTCC Centers in the coterminous U.S. This recommendation is now under review in the 1979 Budget process. The NOAA/FAA Memorandum of Agreement has been updated.

Section VII—Some Marine Matters

- Research be directed towards the development of tables and procedures to allow more rapid decompression of divers, based

on safe physiological considerations, and towards significantly increasing our understanding of both the long- and short-term physiological effects due to work under hyperbaric conditions. An additional $3.5 million should be directed towards these research efforts.

- DOD ensure that increasing reliance on non-DOD sponsored research does not have a deleterious effect on Navy technical posture.
- The Navy initiate efforts to increase the direct involvement with its laboratories and operational facilities of younger faculty members in areas of oceanography and atmospheric R&D.

On 22 July 1977, OSHA published in the Federal Register their final standard establishing occupational safcty and health standards for commercial diving operations. Additionally, the Coast Guard will be publishing within the next 5 weeks a NOTICE OF PROPOSED RULE MAKING covering commercial diving activities from vessels and facilities under Coast Guard jurisdiction. A final rule would be forthcoming this calendar year.

Section VIII—Some Atmospheric Matters

- The Congress enact legislation such as H.R. 10013, the "National Climate Program Act of 1976," to: provide for a program of climate watch, development of improved climate forecasting, and conduct of climate research; and to authorize the Secretary of Commerce to coordinate the efforts in the field of the various concerned Federal agencies.
- Action be taken now, by the Executive Branch or by the Congress, to give NOAA the responsibility for coordinating and managing a coherent Federal program of weather modification research and experimentation.

A National Climate Plan has been published.

Section IX—Shorter Comments

No change to SOC letter.